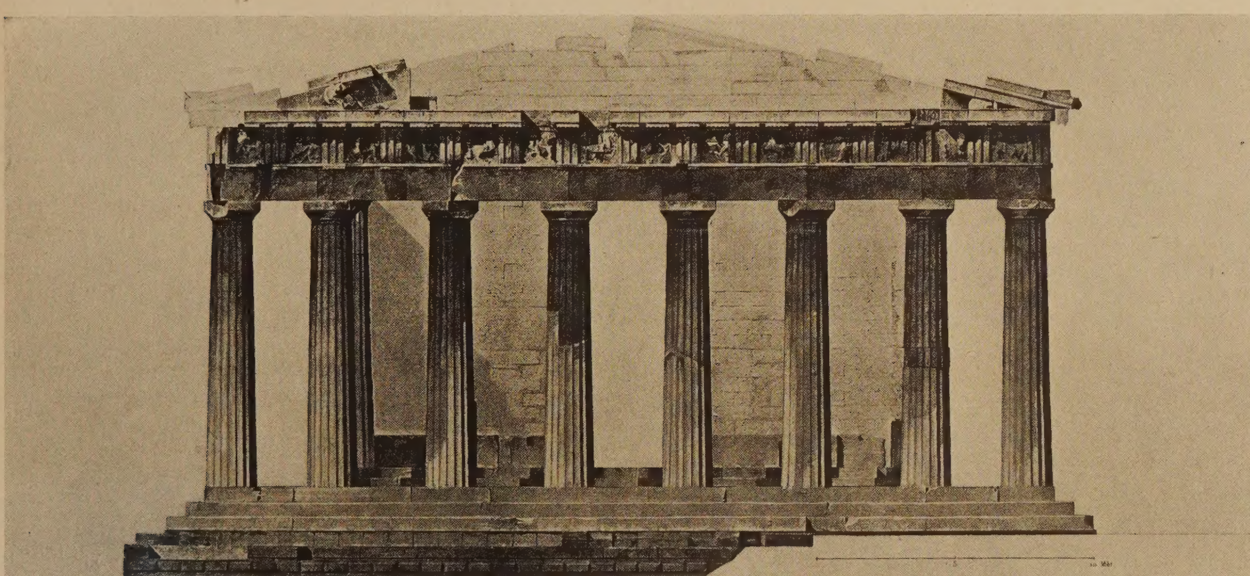
ARCHITECTVRE

THE PROFESSIONAL ARCHITECTURAL MONTHLY

VOL XXXV JANUARY, 1917 No. 1



PARTHENON—PRESENT CONDITION.

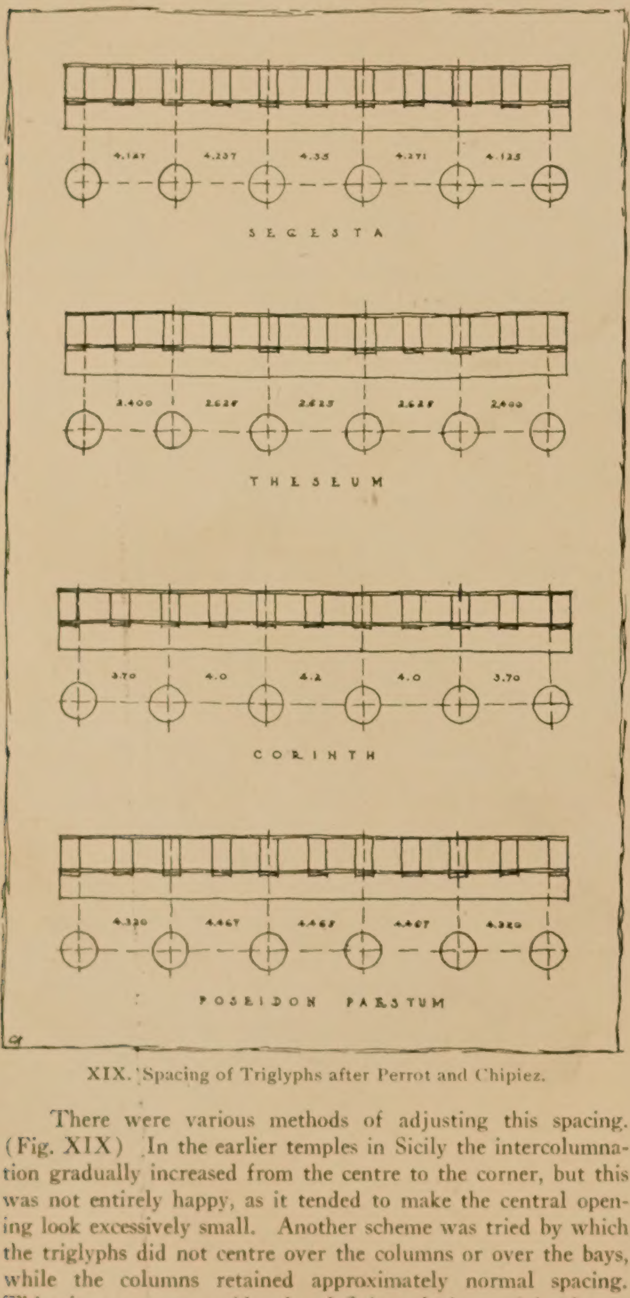
IV. The Classic Orders of Architecture

By Egerton Swartwout, F.A.I.A.

THE DORIC ORDER—Continued.

IT has been hereinbefore shown that the triglyph was an inheritance from a primitive wooden prototype, an inheritance which was not only productive of a noble architectural form but was also responsible for the greatest difficulties in the adjustment of this form to the Classic entablature. The rythmic alternation of triglyph and metope is unexcelled as a frieze motive, but the necessity of preserving its proper relation gave the Doric architect more trouble than any other part of the structure. The normal and natural position of the triglyph was over the centre of the column and over the centre of the bay, two triglyphs and two metopes to one column, but if this relation was maintained in the case of the corner columns there would be left half a metope on each corner, which would be weak and architecturally unsatisfactory. It is conceivable that some decorative scheme might have been found that would have remedied this defect, but any such solution would have been at the sacrifice of that wonderful simplicity which was so inherent in Doric architecture and would have been abhorrent to the Greek architect. The simplest, and therefore the best solution was adopted. The triglyph was not placed over the centre of the corner column, but on the corner of the frieze. This motive was repeated in the flank so that the two corner triglyphs were contiguous and formed a double-faced triglyph. If with this arrangement the columns remained equally spaced, the two end metopes would be of necessity much larger than the normal, and the rythmic balance would be destroyed; consequently the corner intercolumnation was reduced by enough to equalize the metope; in other words it was a case of the tail wagging the dog; the column centres were determined by the metopes. This diminution was relatively great; it amounted to more than two feet in the Parthenon, and is distinctly percetible, but is not displeasing, nor is it noticeable to the ordinary observer, and it even possesses a great artistic value. It tends to give the temple an air of solidity at the corners, which

is most essential, and this effect of solidity was enhanced by making the corner column slightly larger than the normal by about one-forty-fifth. This diminution of the corner bays was attributed by Vitruvius solely to the fact that as the end column could be seen in silhouette against the sky, it would look thinner and the bay would look wider than the normal. This undoubtedly would be the case to a certain extent, and there is no doubt that the narrower intercolumnation is an architectural betterment, but that the Greeks were influenced solely by the spacing of the triglyphs is shown by the fact that this diminution is observed only in Doric temples. It is not found in other styles in Greece, nor in any examples in Rome.



XIX. Spacing of Triglyphs after Perrot and Chipiez.

There were various methods of adjusting this spacing. (Fig. XIX) In the earlier temples in Sicily the intercolumnation gradually increased from the centre to the corner, but this was not entirely happy, as it tended to make the central opening look excessively small. Another scheme was tried by which the triglyphs did not centre over the columns or over the bays, while the columns retained approximately normal spacing. This also was not considered a definite solution and in the so-called Theseion and in the Parthenon the centre bay was slightly larger than the normal spacing, which extended to the end bay with little change, the end or corner bay receiving a sudden and relatively large diminution. The triglyphs were then approximately spaced over the centres of the columns, the metopes being nearly uniform in size. That these difficulties, but not their solution, were appreciated by Vitruvius is shown by his statement that the use of the Doric order was abandoned by reason of this inherent difficulty, and he adds that if it was considered essential to make use of this order then the triglyphs should not be placed at the corner of the frieze but over the centre of the corner column, a statement which is precisely what one would expect from such a source.

Unfortunately, the difficulties in spacing were not confined alone to the outside of the entablature. It was almost an impossibility to adjust the beams in the ceiling of the pteroma so that they would agree with the external spacing and with the spacing of the triglyphs of the pronaos, and undoubtedly to this difficulty is to be attributed the elimination of the triglyphs of the pronaos and the introduction of the Pan-Athenaic frieze in the Parthenon. It is singular and encouraging that two of the most artistically successful features of the Doric temple were in reality expedients, the result of earnest and long continued effort to overcome inherent defects.

The spacing of the columns of the flank generally is approximately equal; the differences are so slight that it is hard to imagine why absolute symmetry is not maintained, the only explanation given being that of Penrose, who attributes it to the difficulty in obtaining architrave stones of requisite length, stating that these slight irregularities were caused by the unwillingness of the Greeks to discard a stone which, by some fracture or error in cutting, was not exactly the right length. This explanation apparently does not take into consideration the extreme improbability of the quarrying and cutting of all the architraves before any of the columns or the stylobate were set; nor the fact that similar irregularities are to be found in the so-called temple of Theseus, which is so small that this hypothesis could not well be maintained. In default of a better explanation, it would almost seem that these irregularities were allowed, or even sought, with the general idea that the building was thereby improved, and that possibly for the same reason the columns themselves vary slightly in diameter. That the Greeks did this knowingly is shown by the fact that the eastern and western fronts of the Parthenon agree in width on the stylobate to one two-hundredths of a foot; and further as an evidence of the care in matters which, though small, are important, the size of the abacus of the corner column is relatively smaller in proportion to the column than is normally the case, to the end that on account of the increased size of the corner column, the abacus may not project unduly beyond the face of the architrave.

One of the most interesting indications of the care which was lavished on their more important work by the Greeks was brought to light by the discovery of the curves which existed throughout the Parthenon, the Theseion, and to some extent all of the major Greek temples. In the Parthenon and Theseion practically all the lines were curves and few of the surfaces vertical. The columns were not set truly plumb, and the top of the stylobate and the under side of the architrave were bowed upward in a gradual convex curve. The history of this curvature and the reasons for it have been admirably given by Professor Goodyear, the general idea being the same that influenced the application of the entasis, and probably also the irregularities of spacing on the flank—a general abhorrence of mechanical stiffness and regularity. The old theory that these curves were introduced to correct optical illusions cannot be maintained. For the architrave to appear to sag in the middle it would be necessary for the observer to be far enough away so that his eye could take in the whole front without changing its direc-

tion, and this distance would be so great that all the detail would be lost and the sagging could not be detected, this idea evidently originating from the effect given on a rendered drawing and not from the building itself. An interesting commentary on this point of view is shown in a recent discovery in the temple at Cori. The architrave under the pediment, while level, has a concave curve in plan, which, when seen from below, naturally would tend to produce that very sagging effect to prevent which these curves are said to have been used.

In the application of these curves, then, there is no general rule. They are varied in different temples and often in the same temple. They were part of the design, and any strict rule would defeat the principal purpose of their application, and in this connection it might be stated that the word curve is rather a misnomer, the effect of curvature being obtained by a series of straight bends, the curves being so extremely slight that the breaks in the line are imperceptible.

It would be interesting to know whether this system of curvature has ever been attempted in modern architecture. The method of cutting stone is nowadays so mechanical that the additional expense would be a deterrent, and it would present certain difficulties in setting; still, it is perfectly possible, and I hope to see it tried; but whether in the necessarily complicated modern structure it would repay the trouble and expense involved is problematical. I have carefully observed many long colonnades where nothing of the kind has been attempted, and while naturally it is impossible to say whether or not the colonnades would have been improved by its application, still I could detect no sagging or other unpleasant defect.

Another refinement introduced by the Greeks was the inward inclination of the column, which was practiced partially for the same reason as was the system of curvature, but chiefly to correct a certain optical illusion by which the columns in a peripteral temple would seem to lean outward, if set vertically, and also to give not only an apparent but also an actual increase of stability. The most stable form in architecture is the pyramid, and to insure at least an appearance of stability a pyramidal form is essential. Practically, also, this inclination would tend to make the temple slightly more secure in case of earthquake, which was the cause of the destruction of many ancient monuments. It has been advanced that this inclination was due to the fact that if the column was vertical the pteroma would appear wider at the top than at the bottom, but it would seem that this effect is more noticeable in a section than in reality, and although the diminution would certainly improve this condition, its real cause must be sought elsewhere. The inclination was usually about equal on the four sides of the temple, and in the Parthenon amounted to about two and three-quarter inches in the height of the column, 34′ 3″—the corner columns naturally inclining inward on the diagonal. A peculiar variant was found in the so-called Theseion, where the columns of the front were not only inclined inward, but sideways, toward the axis of the building, this sideways inclination being greatest at the corners and decreasing almost to the vertical for the centre bay. This was evidently an ultra refinement suggested by some fancied defect in the inclination of the columns of the Parthenon and tried in the Theseion which was built shortly after. The inclination of the column was taken up entirely in the upper and lower drums, the beds of which were not parallel, the beds of the intermediate drums being parallel and perpendicular to the axis of the column, while the top bed next the cap was sometimes also inclined to correspond with the curve of the architrave, just as the abacus always followed this curve.

In modern architecture the use of this inclination of the column has been quite frequent. I myself have employed it several times, and while its use is attended with some difficulty in setting, it can be done safely enough. The inclination of the axis can be obtained by the use of the plumb-bob, which is difficult owing to the diminution and the entasis, or by stretching a stout wire a short distance outside of the bays with the correct inclination. From this wire a trammel of the requisite length will give the location of the centre of the column.

As would be naturally expected from this inclination of the column, the architrave and frieze had also an inclination inwards, but to a greater degree, about one in eighty, the greater inclination being caused by the relatively lesser height of these faces, and by the necessity of their lines being in harmony with the great diminution of the column. Of the smaller vertical faces, the abacus and the corona leaned outwards very slightly, probably for contrast and for a better effect of light and shade. The wall of the naos sloped inward, but the face of the anta of the pronaos had a slightly outward slope, the first from analogy to the columns, but the second for no reason that can be seen, unless for some effect of contrast. I attempted to try the effect of this on the small scale model above referred to, but the model was not large enough to show such delicate adjustments. The pediment had a slightly forward inclination, while the tympanum inclined backward a little, with the object doubtless of restoring the feeling of verticality to the pediment.

Another refinement introduced by the Greeks was the application of a curve to the outline of their columns, but this curve, called by them entasis, was so slight in the examples of the better period that until comparatively recently its existence was unsuspected. Its purpose was not to correct the imagined optical illusion that the column without this curve would appear hollow at the centre, as this effect is impossible, owing to the relatively great diminution of the Doric column, but rather for the same reason that led to the employment of the horizontal curvature, the latter giving a more pleasing outline to the stylobate, and the entasis a more graceful outline to the column.

The entasis is usually expressed in terms of the maximum projection of the curve beyond an imaginary straight line connecting the upper and lower diameters, and in the Parthenon amounts to only three-quarters of an inch, or approximately one-twelfth of the semi-diameter, and in the Theseion it is even less, about five-sixteenths of an inch, or one-sixteenth of the semi-diameter, the above figures being taken from Penrose, who says that the curve is a hyperbola with the apex of the curve below the base of the column, the maximum entasis occurring at two-fifths of the height of the column in the case of the Parthenon, and at half the height of the column in the case of the Theseion. This curvature, then, in the later work, was so extremely slight as to be almost imperceptible, whereas in the primitive temple it was excessive and very noticeable, the reduction of the curve of the entasis keeping pace with the refinement of the column in the diminution of its proportion and in the softening of the abacus projection.

It would be interesting to know just how the Greeks laid out their entasis. Penrose assumes it was laid out from the ordinates of a small hyperbola, and it is possible that such a thing could be done, but such an assumption is merely in line with the idea of the mathematical theory of proportions, which is so absolutely foreign to Greek character or to the method of any designer, either a Greek or a man of modern times. When you consider that the entasis in the Parthenon is so slight that for centuries it was unsuspected, is it reasonable to assume that Ictinos had the slightest interest in knowing whether this curve was a hyperbola or a parabola, or the segment of a circle.

Probably all he knew and all he cared was that the curve was satisfactory and that it fulfilled the purpose for which the entasis was used; it is absolutely inconceivable that he arrived at his decision from any geometrical layout. Unquestionably the matter of the entasis was decided by careful and exhaustive study from a model, probably at full size, and from this model a template was made, to serve as a guide in cutting the flutes, which was done in situ, for it was a peculiarity of Greek work that the stone was mostly set in the rough and finished, as we say, "on the job." The cap was completed, except that the abacus was protected from spalling by projections left on the corners, and on this same capstone the top of the flutes were cut. On the bottom drum also the flutes were cut for a distance of a few inches, this being done to serve as a guide in the completion of the flutes and for greater accuracy in the setting of the bottom drum. The intermediate drums were set in the rough, the beds only being carefully dressed, and the centre fixed by the insertion of a wooden plug, which served not only to locate the centre, but also as an axis in the rubbing of the drums, for in their desire to have the columns appear monolithic the Greeks went to extremes in the fineness of the joints that have never since been attained. The beds were not only rubbed, but brought to practically a half polish, and were then ground stone upon stone, so that there was practically no joint at all, and in order to facilitate this rubbing the point of contact between the two stones consisted only of a ring of about three or four inches in width around the circumference of the drum and a smaller ring at the centre, surrounding the hole left for the dowel, the intervening space being cut away so that there was no contact between these rings. This method was not at all structural, and if the columns had been called on to support any great weight, it would have undoubtedly resulted in spalls at the edges, but as the Greek Doric columns were capable of carrying a load enormously in excess of the actual weight of the entablature, the scheme used had no bad results. It was just this anxiety for thin joints that led to the cutting of the flutes in place, for it would be manifestly impossible to set these fluted drums without spalling, with such a tight joint. In point of fact, whether due to the precedent set by the columns or whether due to the lack of knowledge of any other method by the Greeks, the entire building was practically set in the rough and cut in situ. Even the stones of the stylobate and the ashlar of the cella walls were set rough, and afterwards dressed to a perfectly smooth plane surface, but in this case also the joints were treated in practically the same manner as the beds of the columns, and in order to insure accuracy in setting and as a guide for the future re-surfacing, a narrow draft line was finished around the edges of the stone, so that when first set these stones presented an appearance not dissimilar from certain forms of rustication. Indeed, it is probable that the idea of rustication originated from this early method of re-surfacing, and this would account for the fact that in most Classic rustications the joint is in the centre of the depth of the rustication, instead of being on the edge of the projecting part, as is usual in modern construction. A Greek example of rustication may be seen in the base of the monument of Lysicrates. This method of re-surfacing the entire temple after the work was set is clearly shown by the fact that in many of the temples certain portions have never been completed. In some instances the columns remain as they were originally set, the flutes having been started only at the top and at the bottom, the drums still retaining the peculiar projecting lugs by which they were raised into position, and which also served as fastenings for the tackle used in grinding. A peculiar instance of the non-completion of the work is observed in the Parthenon, where on the upper drum of one of the columns there is a space about the size of a hand, on which for some reason or other the flutes have never been finished.

No record has come down to us of the exact method employed by the Greeks in cutting the flutes. Penrose has indicated a scheme which is perfectly practicable, and which was undoubtedly adopted, namely, that a full size template was set in position vertically opposite the edge of the flute which was to be cut, the template being fastened at a fixed distance from the arris of the flute on the top and the bottom drums. A drill stopped at exactly this distance could then be used to bore a series of holes on the line of the arris, and the rough marble cut away to the line thus formed; and having once obtained the correct outline of the arris, the depths of the flutes could be cut in the usual manner, guided by a series of small templates at frequent intervals. This method of cutting the flutes in position, while susceptible of the greatest accuracy, must have been attended by grave difficulties and serious effects if a mistake was made in the cutting. In the latter case it would have been necessary to take down not only the column but a large part of the adjacent entablature. The cap, as has been before stated, was finished before being placed in position, with the exception of certain projections left on the corners of the abacus. It has been stated that there is evidence to warrant the belief that the echinus and fillets were cut by a lathe, not arranged as our modern lathes, in which the stone itself is revolved, but probably by the revolution of some cutting instrument around the stationary stone. In connection with this cap, an idea has occurred to me which I have had no means of verifying, and which I state only as a possibility. The Doric cap, when looked at from below on the diagonal, usually presents an unfortunate optical illusion, in that, due to the triangular-shaped space at the corner, the edge of the echinus seems to dish at the centre. This defect is sometimes extremely noticeable, but is not apparent in photographs of the caps of the Parthenon nor in the casts of these caps. It therefore appears that there might be a very slight change in the curve where the echinus intersects the abacus on the diagonal. A very slight bowing out from the true circle at this point would be imperceptible and would tend to counteract the optical illusion above referred to.

In a former article reference has been made to the architrave as reminiscent of the wall of the original cella or megaron. In point of design its plainness and wall-like character has been most important in giving dignity to the order and contrasting with the richly decorated frieze and the fluted columns below. The beauty of this great plain surface was always appreciated by the Greeks, and was interrupted in only one instance, a debased example in which sculpture is introduced in the architrave. It is true that in the Parthenon there are found holes which supposedly were for the support of bronze shields over the centres of the columns, and probably for inscriptions between, and therefore on most of the restorations an attempt has been made to indicate these shields and the inscriptions. There is good reason to believe, however, that this applied work dated from the Alexandrian period and was not coeval with the building of the Parthenon itself. Architecturally, there is every reason to credit this latter assumption; the shields are extremely disturbing and unnecessary, and would not only interfere with the great plain surface which was so sought for by the Greek architect, but would also render more apparent the discrepancy between the centres of the triglyphs and the centres of the columns.

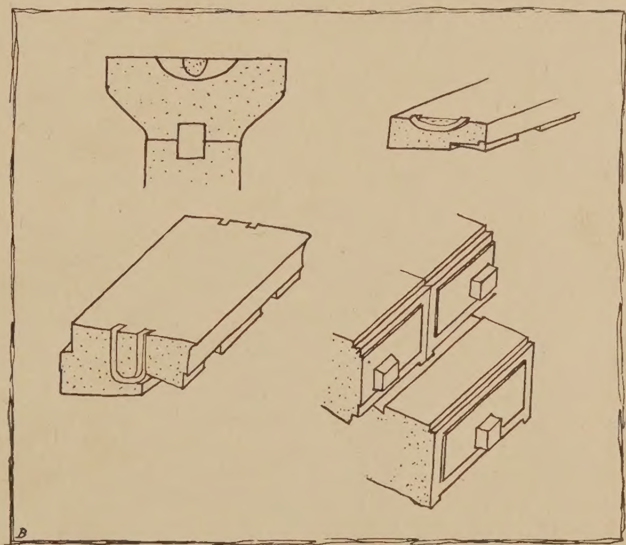
The frieze, as used in the exterior, was always ornamented with the alternate triglyph and metope treatment, the spacing of which gave so much trouble and has been hereinbefore re-

ferred to. The rythmic effect of this alternation was apparently much sought after by the Greeks, and was increased by the polychrome decoration which was probably to some extent universal, and it was further emphasized by the introduction of sculpture in high relief in the metopes. In the Doric entablature the triglyphs, although channeled, present a relatively plain surface, as compared with the metopes; in other words, in a rendered monotone drawing, they would appear white as against the gray of the metope, and would tend to recall the white fluted column, although this white was, on account of the channeling, not quite as brilliant as the white of the architrave and of the corona; the abacus projecting forward, as it did, would be less white than the architrave, and would then tone in with the shaft of the column and become part of the column, rather than part of the architrave. Especial emphasis should be given to this point, because in the line drawings which we are accustomed to think indispensable to the representation of Classic architecture, the triglyphs are apt to be represented as gray and the metopes white, especially when no sculpture is employed in the metopes. In the modern use of the Doric order this question of color is usually overlooked, and when, as is sometimes the case, granite is the material used, the triglyphs are scarcely distinguishable from the metopes, as on account of the splayed channeling there is seldom a chance for any direct shadows on the triglyph itself. It would, therefore, seem not only rational but necessary from the standpoint of design either to introduce carving or sculpture into the metopes, or else use some slightly darker material. It might be that by a little care in selection certain blocks of granite or marble could be secured for the metopes which would be a little darker or more profusely veined than the triglyphs and architrave, and I feel sure that if this were done the effect would be extremely good. The need of some accent in the shadow of the triglyph is shown in its highest development in Athens by the undercutting of the channeling at the top of the triglyph. The finish here is very interesting and effective, but is almost impossible to show by a drawing, and therefore a model of the upper portion, at least of the triglyph, is absolutely essential to guide the modern stonecutter.

The cornice is relatively the smallest member of the Doric entablature, and in this respect is in direct contrast to the cornices in other and later styles, the essential difference being that in the Doric entablature the frieze was the main feature, while in the Roman Corinthian the cornice was by far the most important member. It is a matter of conjecture whether the narrow shelf-like cornice, which is typical not only of the Greek Doric but also of the Ionic as found in Athens, is due to its derivation from a wooden prototype, or whether the Greeks regarded the cornice not so much as a crown moulding to the building but as a projecting member which would give the requisite shadow and also serve as a protection for the sculpture below. Whatever was the motive that led to its general use, it is evident that the Greeks considered that alone it was not of sufficient weight, therefore, in the pediment a large cymatium was added above the corona, which served not only as a gutter but also to give added weight to the cornice when viewed directly in front. That this cymatium was not carried around the flanks of the building is probably due to the fact that most Greek temples were so low that their roof was generally visible, and this roof being composed of marble tiles, was white, and moreover was furnished just above the corona with certain antefixes; and all of this tended to make the cornice appear heavier than it really was. It is my opinion that if the Greeks had found it necessary in the best period to use a roof covering that was relatively dark, they would have felt the need of increasing the weight of the cornice.

This thinness of the cornice doubtless has been noticed often, but is generally blindly copied, for in modern times we are so accustomed to the employment of Classic orders just as we find them in the books that our critical sense of design is stifled and we feel that although the result is not entirely satisfactory, the cornice must not be criticised because it is exactly of the modular dimensions shown in the restoration. Another point should be always borne in mind, and that is that the use of the Greek Doric entablature as we know it was confined entirely to the exterior of the building. When the Greeks, as they often did, felt the necessity of using the order in the interior, or employing the entablature more or less as a string course, the proportions and general arrangement were entirely different.

Allusion has been made to the fact that Greek work was generally finished in situ, and that there are still to be seen on some of the unfinished columns projecting lugs, which were used to raise the drums into position. Other fragments that have been found give clear indication that the Greeks were also familiar with the use of the lewis and that dogs were sometimes used. In other cases (Fig. XX), U-shaped grooves were cut in the sides of the stones, and rope slings were employed, the rope being pulled out through the grooves after the stones were set. To raise the stone, some kind of tackle was



XX. Various Methods Employed in Setting Greek Work.

used, for the Greeks were familiar with the principles of the pulley as well as of the lever, and it is probable that there was also elaborate and heavy scaffolding, access to which may have been arranged by inclined planes.

Bronze dowels and anchors of various sizes and shapes are in constant evidence, although the metal has long since disappeared, and these ties formed the only bond between the stones, as no mortar was ever employed, the stones being set dry, a system, which, though unsuitable to this climate or to that of Northern Europe, was satisfactory enough in the mild climate of Greece.

It must be borne in mind that the Greeks were not great constructionists from an engineering point of view. In their use of stone they adhered entirely to a trabiated construction, although there is no doubt that they understood the principles of the arch, and this same trabiated construction was followed in their wooden forms, as they apparently had no conception of the principles of a truss. Their stone forms were infinitely in excess of the size demanded by the stress, and, consequently,

when a structure of the scale of the temple of Zeus at Agrigentum was contemplated it proved beyond their constructive powers, and expedients were resorted to which were entirely destructive of that beauty of proportion which is to be found in other temples. In some rare instances there is evidence to show that an attempt was made to reinforce the lintels with iron, but this evidently was considered an expedient, and never generally or successfully adopted. A curious evidence of their efforts to diminish the load of the ceiling beams is shown in some late examples in which the marble beams were hollowed out at immense expense of labor, thus making a box-like beam which must have been extremely difficult to handle, and which was entirely unnecessary.

There can be no doubt that practically all the temples of antiquity were painted, the use of color being universal from the earliest times in all ancient countries. This fondness for bright color is a primitive instinct, and was a form of decoration which was most easily obtainable. The savage painted or tattooed his body and applied what pigments he could obtain to the decoration of his rustic shrine. In the wooden prototypes of Classic architecture the use of color was general, not only from a decorative point of view, but as a preservative of the wood, and it was only natural that this same fondness for bright colors should continue after the wooden forms had given place to stone. This painting of stone work is to us Northern races almost inconceivable, and this difference of taste must be due to climatic conditions. To a Northern mind it seems that no Southern race, not the Greeks nor the Romans, nor the Italians even, used stone to the best advantage. Their demand for color apparently blinded their eyes to the beauty of the stone itself. The Greeks, with an abundance of the most beautiful marble that has ever been found, disguised the material by surface treatment so that its structural beauties were lost sight of, and their buildings might as well have been made of stucco, as indeed was the case in many of their temples, for whenever it was necessary to use a rough local stone the face of the stone was completely covered by a thin coating of hard stucco, which was then painted in the same manner as the smoother marble. This same feeling can be noticed at the present day. In modern Rome it is difficult to tell what buildings are made of stone and what are made of stucco, as on account of the paint and surface treatment, they look practically alike.

The evidence that color was used in ancient times is attested by numerous fragments which have been found, which still show plain traces of color, and from these fragments the general color treatment used in the more important temples has been carefully worked out, but although this traditional convention was generally followed, it was by no means universal. Local conditions or the impossibility of securing a variety of colors limited their application in many places. In the Periclean age not only were red, blue and yellow used, but there is evidence that green was employed occasionally, and further that gilding was in quite general use, and although these colors were applied in their primary values, still on account of the relatively small field of each color and their combination, it by no means followed that the general effect was as harsh as is usually conceived. Undoubtedly the Doric temple with its brilliant coloring, enhanced by the gilding of the statues and votive offerings, surrounded by the rich green of the sacred trees, under the bright blue skies of Greece, would form a setting well adapted to the gorgeous religious rites for which the temple was conceived.

PARTHENON—RESTORATION BY PACCARD.

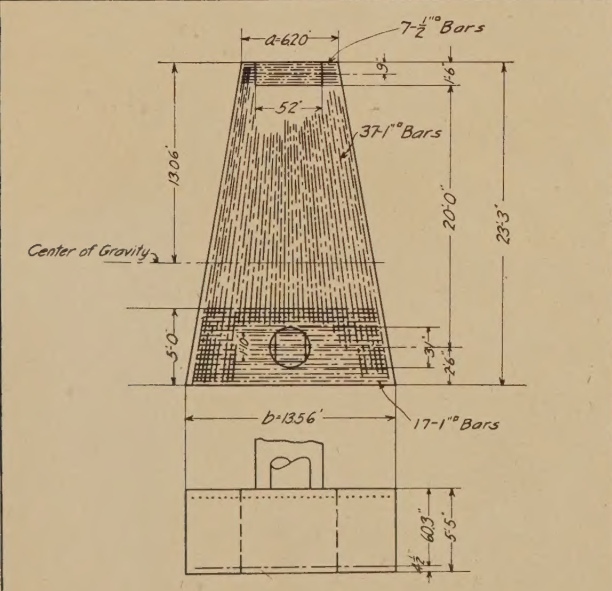
XIX. Engineering for Architects

By DeWitt Clinton Pond, M. A.

Mr. Pond has charge of the practical course in Architectural Engineering at Columbia University. He is the author of "Engineering for Architects" recently published in book form. This series, started in July, 1916 ARCHITECTURE, is a continuation of the previous series concluded in the issue of June, 1915.

THE last article dealt with the subject of designing a reinforced concrete footing having the shape of a trapezoid, and upon which an exterior and interior column rested. In this design there were found to be a great number of considerations involved and, although each difficulty could be solved if the architect were determined to do so, the number of questions involved would be apt to discourage one without this determination. It may be encouraging to know, however, that experienced engineers are forced to take a considerable amount of time to design such a footing and that if one has the knowledge to do this he may consider himself a fairly good engineer.

In the last article the dimensions of the footing were found first. The centre of gravity between the two columns was determined and a trapezodial footing designed so that the centre of gravity of the footing corresponded with the one already found. Then the depth was investigated and it was found that this was determined by the effect of punching shear due to the interior column. The depth was established



FIGVRE 98

as 60.5 from top of footing to centre of steel. As it was decided to have the bottom steel grouped under each column and the top steel spread out over the footing the next step was the determination of the steel under each load. The next calculation was to determine the point of no shear and maximum bending and once this was found the bending was determined as 2,608,000 foot-pounds, and, to counteract this tendency to bend the footing at a point between the columns, the steel must be placed at the top of the footing.

For those who followed the discussion in the last article, the facts given above will serve as a review, and it will be apparent that the conditions that govern the design of the girder or beam also govern the design of the footing. The difference is that the loading on a beam is downward and the pressure of the columns is upward and on the footing the uniform pressure of the soil is upward and the column loads are downward. This fact makes it necessary to put the steel in the upper part of the footing, whereas the steel in the girder is in the under part. In the same manner as the steel in a girder is bent up over the supports, it is bent *down* under the columns, in the case of the footing.

If the architect is not fairly familiar with the facts governing the design of girders he should look over Article XIV, in the August number of ARCHITECTURE, and refresh his memory concerning the reason for bending up steel, the number of stirrups needed to counteract diagonal tension, and the allowable area of bent up steel to be taken as withstanding diagonal tension.

As has been stated the bending moment was found to be 2,608,000 foot-pounds. This will equal 31,296,000 inch-pounds. The total stress in the steel multiplied by seven-eighths of the depth should equal this, or, to reverse the reasoning, divide 31,296,000 by seven-eighths of the depth and S, the total stress in the steel, will be obtained, and if this result is divided by 16,000 the area of steel will be determined.

$31{,}296{,}000 \div (\frac{7}{8} \times 60.5 \times 16{,}000) = 37$ square inches of steel that will be required to reinforce the footing against bending.

As in the case of the girder it will be well to check the concrete against compression. This will be done as shown in Article XIV with the exception that the width of the beam has to be taken as the width of the trapezoid at the point of maximum bending. In the last article this width was found to be 9.70 or 116.4 inches. The distance to the neutral axis of the footing is three-eighths of the depth to the steel, or $\frac{3}{8} \times 60.5 = 22.7$ inches above the bottom of the footing (Fig. 105). The average pressure on the concrete above the neutral axis per square inch will be one-half of 650 or 325 pounds per square inch. The total allowable pressure on the concrete will be $116.4 \times 22.7 \times 325 = 858{,}700$ pounds. This allowable pressure may be determined in another manner. In the July article it was stated that the stress in the concrete was equal to $1{,}462.5 \times d$. This applied to a slab one foot wide, and for the footing which is 9.7 feet wide and 60.5 inches deep the compression will be found to be $1{,}462.5 \times 9.7 \times 60.5 = 858{,}600$ pounds which checks approximately with the result given above. This second method is shorter than the first and should be used.

The total tension in the steel was found to be 591,190 pounds and, as the total tension and total compression in any beam are equal, it can be seen that the allowable compression in the concrete—858,000 pounds—is much greater than the actual compression, so the footing is safe in this respect.

(Continued page 9)

HOUSE, HENRY R. SWARTLEY, JR., GREAT NECK, L. I.

Bates & How, Architects.

(Continued from page 7)

The next item to be checked is the diagonal tension. To understand the conditions that govern the design of stirrups of bent up bars to withstand this type of stress, it will be necessary to investigate the shear diagram shown in Fig. 103. It will be noticed that the shear starts from zero and rises rapidly to 445,400 pounds. This rise in shear is due to the

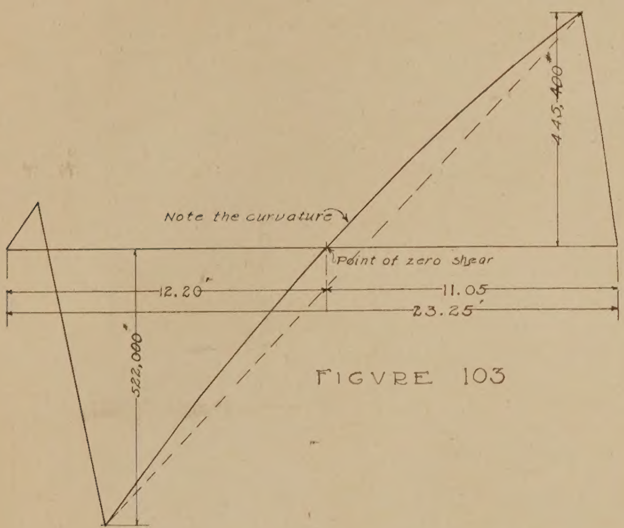


FIGURE 103

500,000 pound load and the shear would be equal to this load if it was not for the upward pressure of the soil which reduces it to the figure given above. Now the actual line representing the shear will be a curved line from the point just found to the point of zero shear which was found in the last article to be 11.05 feet—approximately—from the right end of the diagram.

The curvature of this line will be slight but is noticeable in the diagram. The figures given in the diagram are for the total shear at each point and from these figures it will be necessary to find the shear per square inch. In order to do this the total shear must be divided by the width in inches and by seven-eighths of the depth in inches. The width of the footing at the point where the 445,400 pounds shear occurs is 6.68 feet or 80.16 inches. The shear per square inch will therefore be given by the following division. $445{,}400 \div (80.16 \times \frac{7}{8} \times 60.5) = 105$ pounds.

In Fig. 104 the diagram representing the shear per square inch is shown. For the purpose of this article the drop in shear will be considered as a straight line, although it would

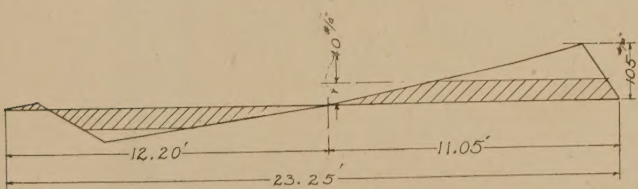


FIGURE 104

actually be a slightly curved one. The maximum shear is represented as being 105 pounds per square inch. As has been stated in a previous article that the maximum allowable shear per square inch, according to the New York Building Code, is 150 pounds, of which 40 pounds is allowed to the concrete and 110 or less pounds is to be carried by the steel. In the present case the amount of shear to be carried by the steel is 65 pounds per square inch. The shaded portion in the diagram represents the shear carried by the concrete.

The point of maximum shear is at the inner edge of the pier and is 1 foot and 6 inches from the outer edge of the footing. The point of zero shear was determined in the last article to be 11.05 feet from the end and so the distance between the point of maximum shear and the point of no shear is 9.55.

The unshaded portion of the diagram—representing the shear per square inch to be carried by the steel—is a triangle having an altitude equal to 65 units and a base equal to sixty-five—one hundred and fifths of 11.05. $(11.05 \times 65) \div 105 = 6.84$ feet or 82.08 inches. This is the length of the horizontal plane over which the shear is distributed and the width will be assumed to be 6.68 feet or 80.16 inches. The maximum unit shear is 65 pounds and the *average* unit shear will be one-half of this or 32.5 pounds per square inch. If this is distributed over the plane, measuring 82.08 inches by 80.16 inches the total horizontal shear will be $82.08 \times 80.16 \times 32.5 = 214{,}000$ pounds.

This shear, or diagonal tension, must be taken care of by means of stirrups or by bent up steel. It must be remembered that the reason for bending up the steel in a footing of this kind is to reinforce the concrete against such shear as it is possible to counteract in this manner. The fact that steel is bent up in a continuous girder or beam should not mislead one as to the reason for bending the reinforcing bars in the present case. A continuous beam tends to bend in one direction over a support, and in the opposite direction in the centre of the span. It is necessary, therefore, to have steel in the upper part of the beam over a support, and in the lower part between the columns, and the reinforcing steel is bent to follow approximately the tension stresses in the concrete.

The footing, however, is practically a simple beam—a beam carrying a uniform load between the supports—and in this kind of a beam there is only one kind of bending. Any steel that is taken from the upper part to reinforce against horizontal shear can only be taken at points where the tendency toward bending becomes small enough to allow this to be done.

In order to understand where the tendency toward bending is large and where it falls off it is convenient to study

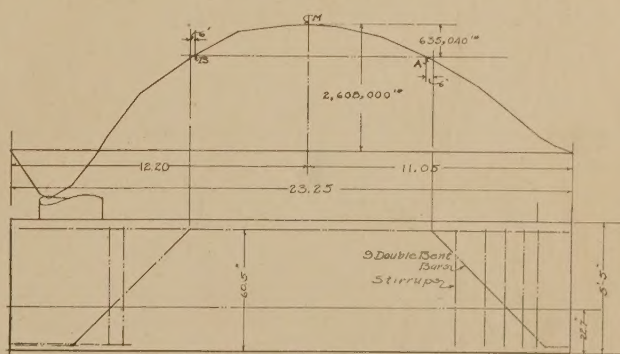
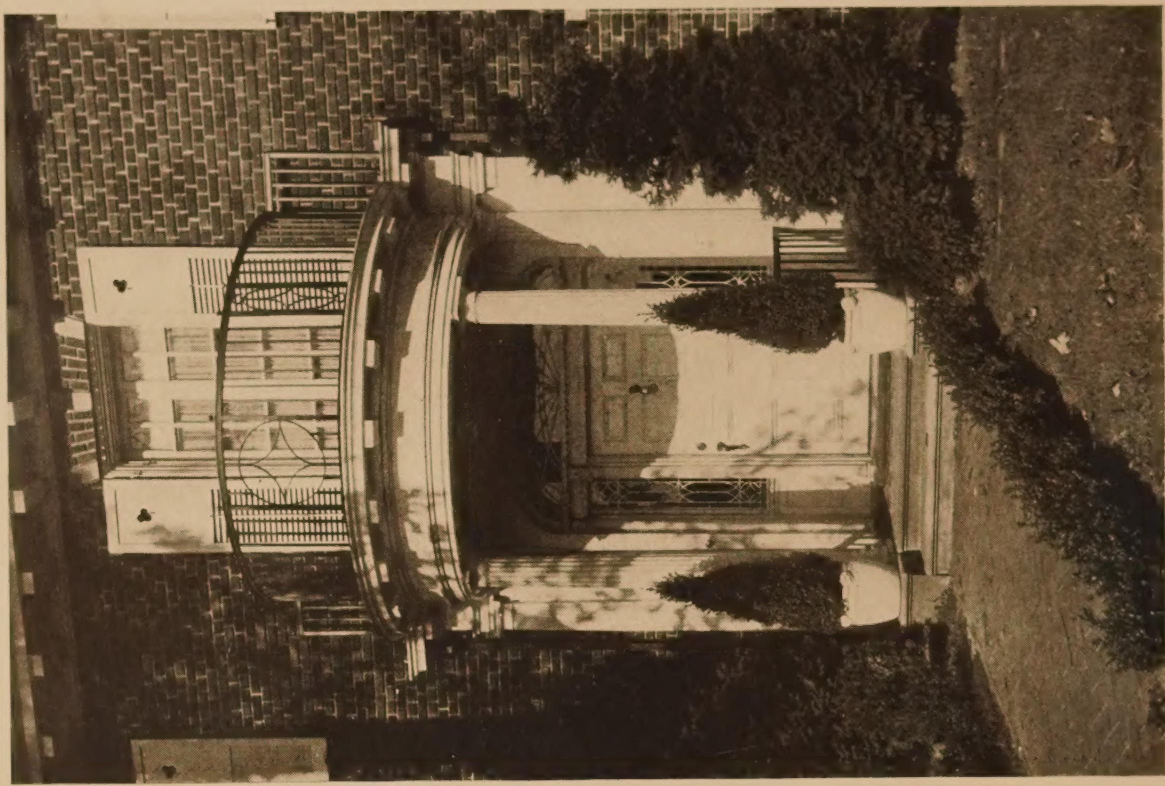


FIGURE 105

the bending moment diagram shown in Fig. 105. From this diagram it can be seen that the maximum bending occurs at a point 11.05 feet from the right hand end of the diagram—the point of zero shear—and that it becomes smaller in the form of a curved line at either side of this point. It will also

(Continued page 11)



DETAILS, HOUSE, HENRY R. SWARTLEY, JR., GREAT NECK, L. I.

Bates & How, Architects.

(Continued from page 9)

be noticed that there is a slight negative bending at the inner end of the footing where there is a slight overhang. To draw such a diagram is a tedious task and engineers seldom attempt to draw out the entire figure. However, it is absolutely necessary to know what the tendency toward bending is at critical points and for a full and complete understanding of the matter it is very desirable to study such a diagram as shown.

Now at the point of maximum bending there must be the full 37 square inches of steel, as already determined. Let it be assumed that it is desirable to turn down nine bars. This will make a total of nine square inches to be taken from the reinforcing. The stress that can be withstood by these bars is $9 \times 16,000 = 144,000$ pounds. The formula for the tendency toward bending is $M = S \times \frac{7}{8} d$. S is 144,000 pounds and d is 60.5 inches, or 5.04 feet. So these nine bars will resist a tendency toward bending equal to $144,000 \times \frac{7}{8} \times 5.04 = 635,040$ foot-pounds. This is about one-fourth of the maximum bending moment—2,608,000 foot-pounds.

The maximum bending is designated by the letter M in Fig. 105 and from this point measure down 635,040 units, which represent foot-pounds, and through a point thus found draw a horizontal line cutting the bending moment diagram at A and B. Beyond these points the steel may be bent down but it is desirable to allow 6 inches for the bars to develop a proper bond stress between the concrete and the steel.

By referring to the elevation of the footing as shown directly below the bending moment diagram, it is possible to see how the bars are bent, and it will be noticed that it is impractical to bend down more than nine bars at the point A, shown in the bending moment diagram, would be too near the right hand end of the footing and this would bring the bent up steel beyond the point where it is needed most.

The nine bars, having a total area of 9 square inches, will have an effective area equal to seven-tenths of this to be used against the diagonal tension, and this multiplied by 16,000 pounds per square inch will give the stress to be carried by the bent up steel. $9 \times .7 \times 16,000 = 100,800$ pounds. The total shear was found to be 214,000 pounds and by subtracting 100,800 pounds from this there will be left 113,200 pounds to be taken care of by means of stirrups. These stirrups will be bent as shown in Fig. 106 with eight up-standing legs, and if they are made of three-eighths-inch square bars there will be $.1046 \times 8 = 1.1248$ square inches of steel upstanding in each stirrup. Each square inch is good for 16,000 pounds, so each stirrup will be good for 18,000 pounds. $113,200 \div 18,000 = 7$ stirrups that will be necessary.

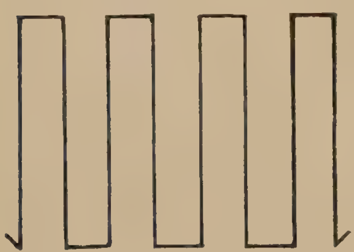


FIGURE 106

So far the design has been carried out for one end of the footing but the other end offers no further difficulties so this will not be gone into. It must be borne in mind, however, that the negative moment, due to the overhang, must be investigated, and if the bent up steel has not a large enough sectional area to withstand the tension due to this bending, more steel should be supplied.

The footing that has been described in this and the last article is probably one of the most tedious to design. Of course, if there is room enough a rectangular footing could be designed that would answer and which would be more easily checked. In case this type should be desired the method of procedure would be to find first, as in the case of the trapezoidal footing, the centre of gravity between the two columns. As the footing is to be symmetrical with regard to its axes, its length must be twice this. The centre of gravity was found to be 13.06 feet from the lot line, and the footing would have to be 26.12 feet long. The area was found to be equal to 230 square feet, and the width of this particular footing should be $230 \div 26.12 = 8.8$ feet. The rest of the design should prove simple with what has been already discussed.

Should it be desirable to group the bars running between the two columns as shown in Fig. 100 the design of the upper

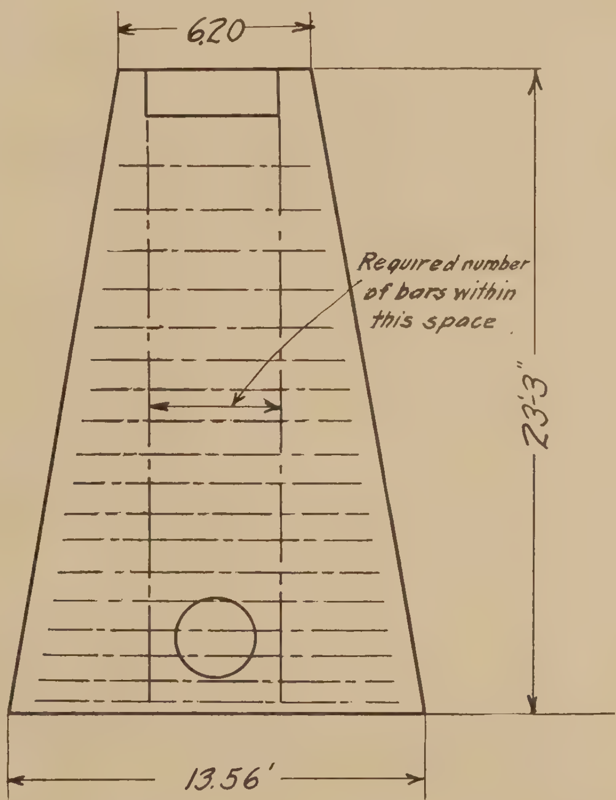
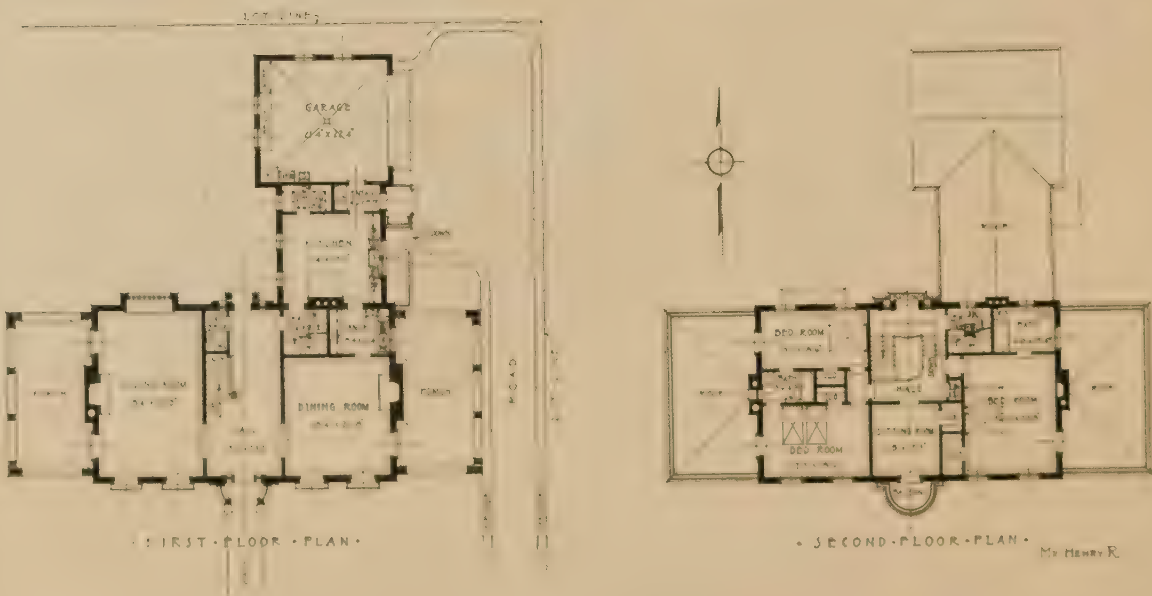


FIGURE 100

bars would be the same as has been given. The design of the lower bars would make it necessary to determine the bending moment in the footing at points spaced at comparatively similar distances along the footing, say three feet apart, and then place the bars to meet the bending at these points.

The architect may notice that the greatest problems involved in reinforced concrete construction are found in the design of footings. The discussions, for the most part, have been confined to this type of design, for with the exception of flat slab construction, which will be taken up on the next, and final article, the problems found in beam and girder construction are comparatively simple. There are several types of footing design that have not been taken up but if the architect has followed the discussions so far and will supplement his knowledge from the more theoretical text books he will have no difficulty in designing almost any kind of foundation.



HALL AND PLANS, HOUSE, HENRY R. SWARTLEY, JR., GREAT NECK, L. I. Bates & How, Architects.

Planning the City for Community Life

By George B. Ford,

Consultant to the Committee on the City Plan of the City of New York

EVERY city is composed of many more or less integrated villages. Each community has grown up by itself, but has gradually become woven into the neighboring villages. With shifting populations their homogeneity and individuality are lost, and it is only consciously through such agencies as the community center, that community solidarity can be re-established.

In any neighborhood, each activity of daily life focuses on a certain limited number of places or buildings. Buying the daily supplies centers about a few shops. Taking the children out concentrates itself on the most open and attractive places within easy walking distance. The quest of relaxing amusement takes the various members of the family to a motion picture theatre, a vaudeville house, a billiard parlor, a saloon, a dance hall, almost all of them scattered along business streets. The children go in other directions to their schools which are usually placed in residential blocks. Libraries and often baths are similarly located. Churches, lodges and clubs are scattered here and there. The local fire engine house, police station, dispensary and milk station are found wherever land is cheapest. No two functions of local life bear any consciously conceived geographical relation to one another. There is rarely even the semblance of a concerted plan for effecting co-operation among these various functions. Despite the abundant examples of business common sense applied to co-ordinating the functions of "big business" or of city administration, little trace of common sense of any kind appears in the way in which cities, or even the local units of a city, are planned for efficiency or amenity..

The first constructive step in correlating such activities is to bring the playground and the school together. According to the Gary idea they must be together. In any case, their uses are so closely related that each is much more effective when combined with the other, to say nothing of the decided saving in cost by having common janitor and other service, and using one set of toilets, lockers, baths, tool-houses, shelters, club rooms. lunch rooms, power and heating plants. Only by such co-operation can full value be obtained from the school house at all hours of the day, three hundred and sixty-five days in the year.

The next step is to group near by various other commonly used buildings such as the public library, the public bath, the local public market, churches, lodges and clubs, and even the hospitals and charitable institutions.

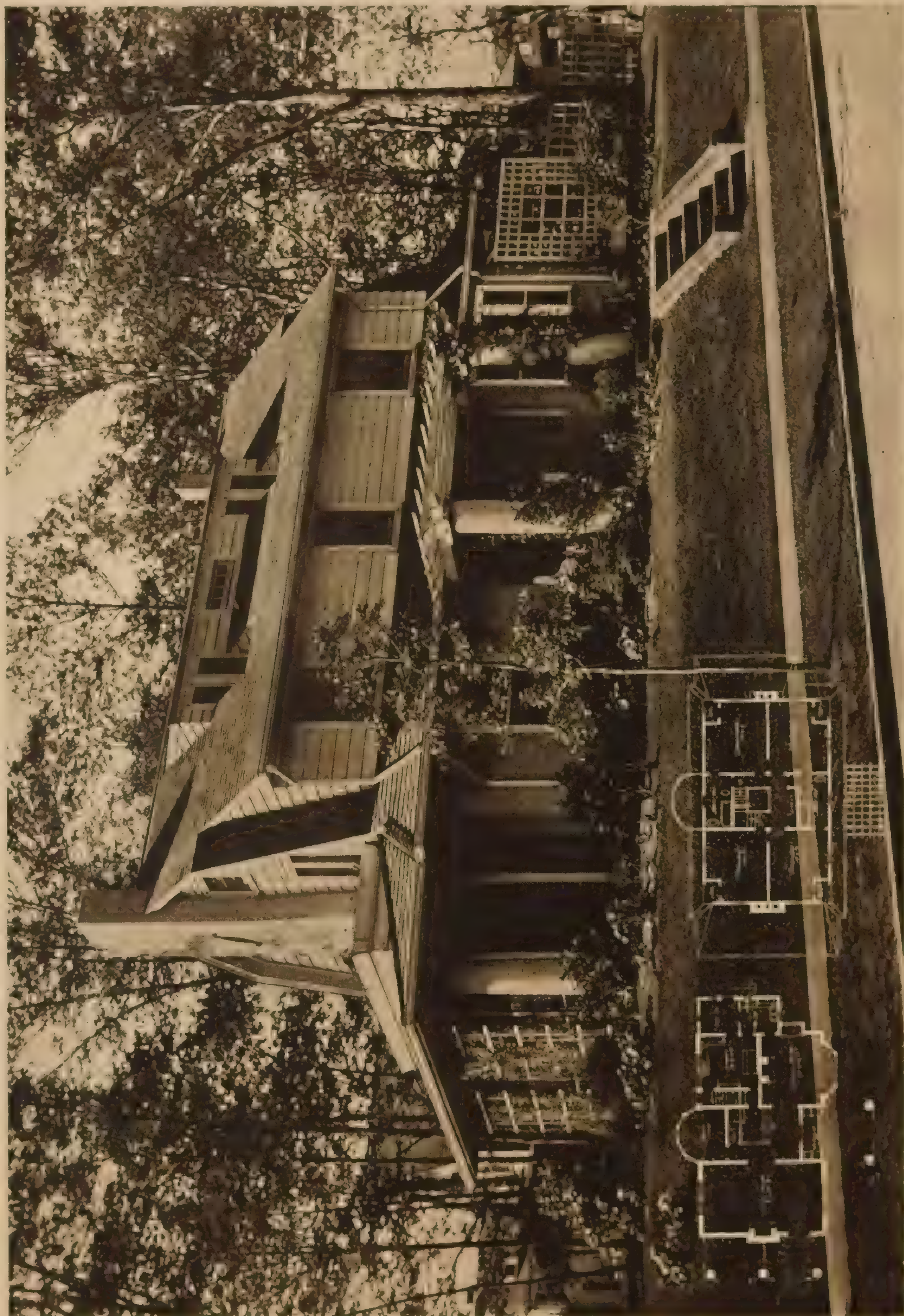
The next step after that is to induce the local stores and business buildings and the various commercialized amusements to establish themselves along the approaches to the center and thus virtually to concentrate all of the common activity of the community in one thoroughly familiar and easily accessible location. People, young and old, men or women, would get into the habit of going to one spot. The more unconscious the habit, the greater would be the frequency with which individuals and families would foregather during the day or evening, the week day or Sunday, the summer or the winter. Suggestive plans for such centers were presented recently in a neighborhood center competition under the auspices of the City Club of Chicago and also in the plans made several years ago for the "Soulard Civic Center" in St. Louis. Such grouping of public and semi-public buildings is bound to have a marked effect on the individual members of the neighborhood. They become conscious that somehow the district is a distinct entity. A local civic pride is engendered. It begets and fosters solidarity which in time must lead to expression in co-operation, and a distinct community life takes form.

However, grouping the various buildings and open spaces so that they operate efficiently together is not enough. We must have beauty as well; beauty of line, of form, of color, of texture, of proportion, of mass, of scale, of setting, of general composition; the perfect adaptation of form to function, the charming expression of function and of unity, and harmony of purpose. Our spiritual man craves beauty. We may not consciously miss it for a long time, but when we do come upon it again we realize what it means to us. It should mean everything to the child, as he grows up, to have lived in an environment of beauty. If he does not have this element in his formative period he will probably never love the beautiful for its own sake and by just so much will add his contribution to the visible ugliness of American life.

Concretely, such an environment would require the designing of attractive yet simple school buildings, set in a parklike playground where children could be taught to respect and to love the growing things of nature. Public buildings well designed and set in such a neighborhood center would become an object lesson for private builders. Competition would begin and before long all would be contributing to the charm of the district. There are few things that foster local pride more quickly than do good buildings, well set, among attractive parks and streets.

To the person who is constantly studying the plans of cities it is patent that rarely in any district is there an arrangement of streets, open spaces and blocks obviously suited to the building up of a community center group. Rarely do our local street systems head up at any one point. Our plans are usually monotonous gridirons without variety or accent. Schematically an ideal plan would provide for the attractive grouping of public and semi-public buildings about a common parklike space where most of the principal arteries of the neighborhood would come together. It would be the obvious center of all the various phases of life in the district.

The whole problem is not solved with the grouping of the buildings that are used by all. There is the most urgent need of putting order into the development of all of the private property in the community by controlling the height of buildings, the area of their yards and courts, and the character of their use all in the interest of the neighboring property. A home owner has no redress against a man who puts up a factory, tenement or garage next door. The city should protect him. Only by this means can homogeneity and harmony in the community be attained.



HOUSE, KEW GARDENS, L. I.

Marvin & Davis, Architects

Legal Decisions of Interest to the Architect

These decisions appear monthly and are edited by Mr. John Simpson, the well-known lawyer.

Lateral Support—Notice.

The Maryland Court of Appeals holds that a landowner, having given reasonable notice of the nature and extent of his intended excavation, is not liable for damages to the wall of an adjacent house, resulting from his ordinarily careful excavation of his own lot. In an action for damages from excavation by an adjoining landowner, there was evidence that the plaintiff's husband was her agent in managing her property, and that the defendants had given notice of intention to excavate by showing him plans of the building they intended to erect on the adjoining lot. It was held that the refusal to admit these plans in evidence was error, where they clearly and plainly disclosed the depth of the foundation wall, indicating the depth of the excavation.—Vandegrift *vs.* Howard, 98 Atl. 528.

Mechanics' Liens—Evidence of Real Value of Labor and Materials.

An owner entered into a contract for the erection of a building for $199,500. Sub-contractors contracted with the general contractor to do all the plumbing, ventilating, steam heating, etc., for $29,800, payments to be made at the rate of 75 per cent. of the work installed each month. Much work was done when finally the general contractor abandoned his contract. At the time of this abandonment the sub-contractor had presented bills month by month, itemizing the amount and value of the labor performed and the materials furnished during the preceding month. The value of these as evidenced by its own bills was $14,532.30, with extra work amounting to $320.35, or a total of $14,852.65. There had been paid 75 per cent. of this, or the sum of $9,267.62. In mechanic's lien proceedings the sub-contractor was awarded a lien for the difference, $5,585.65. On appeal it contended that it was entitled to the reasonable value of the labor and materials furnished, notwithstanding its contract; that this value was not the value evidenced by its bills; that its bills were evidence merely of the wholesale cost; and that as a retailer it was entitled to an addition of at least 20 per cent. above the amount of the bills presented and allowed. The sub-contractor argued that the evidence showed that this added charge of from 20 to 35 per cent. over the wholesale price was reasonable and in accordance with the current course of business.

It was held, however, that it could not be said that the trial court's finding of the reasonable value upon which it based its award was unsupported by the evidence. That evidence indicated that month by month the plaintiff presented its bills, showing the reasonable value of the work performed and materials furnished. In addition to this the claim of lien and the complaint showed, in accordance with the actual transaction between the plaintiff and the general contractor, that 75 per cent. of the value of the labor done and material furnished were to be paid for each month. Moreover, the estimates of these values were, by the terms of the contract, to be adjudged by the architect, and they were so adjudged, and the plaintiff accepted them uncomplainingly until at the time of the trial, when it sought to recover 20 per cent. more, not only more than it had contracted for, but more than it had declared, month by month, was the value of its work and material.—Brandt *vs.* Fresno Hotel Co. (Cal.) 159 Pac. 434.

Indefinite Agreement for Services.

In an action against an architect for wrongful discharge, it appeared that the architect employed engineers, draftsmen and other assistants and agreed that if the plaintiff, one of his employees, would continue work and get jobs started that had been in the office three years, that he, the architect, would, on the 1st of January, close his books and give plaintiff a fair share of the profits. The New York Court of Appeals held that as what was a fair share of the profits was wholly indefinite, the agreement was too vague to furnish a right of action for damages for the architect's breach of contract in discharging plaintiff before the 1st of January.—Varney *vs.* Ditmars, 111 N. E. 822.

Owner's Rights on Surety Bond.

A building contractor who agreed in writing to erect two houses defaulted before he completed one of them. The bond for performance was conditioned upon actual loss which might occur by reason of the contractor's default. In an action by the owner on the contractor's surety bond the New York Court of Appeals held that the owner of the premises, if in good faith proceeding with the erection of the house as to which no work had been done, was entitled to recover the difference between the contract price and the price he was compelled to pay.—Elmohar Co. *vs.* People's Surety Co., 111 N. E. 821.

Restrictive Covenant.

Plaintiff was the owner in fee of a row of four-story houses, in one of which she resided, which were set back 7½ feet from the street line by reason of a restrictive covenant entered into by one from whom the plaintiff and defendant and other owners derived title. The covenant had been observed by her, and by the owners of new buildings on that side of the street, and by nearly all of the owners on the other side, although the neighborhood had changed from a residential to a business section. It was held that, upon defendant's commencement of the erection of a wall extending its buildings 11½ feet toward the street, two or three numbers from plaintiff's property, she was entitled to an injunction pendente lite.—Norrie *vs.* United States Realty & Improvement Co., 157 N. Y. Supp. 91.

Construction of Contract for Architect's Services.

Architects in a letter to a corporation proposed "to furnish professional services for a commission of 3½ per cent. on the cost of completed building and of this amount a sum of $6,000 would be charged for the preparation of preliminary sketches, plans, elevations, specifications and sufficient detailed information to enable contractors to submit proposals. This charge is based upon the understanding that if the work is carried out, it is to be placed with our firm for completion." The preliminary plans were furnished, but the contracts were not let. Subsequently, the purchaser of the assets of the corporation on its dissolution let a contract for a smaller building, the supervision of the work not being given to the architects. In an action by them to recover an *quantum meruit* for a balance alleged to be due them for their services in preparing plans and

(*Continued page 17*)

HOUSE AND PLANS, E. B. FICKINGER, YONKERS, N. Y.

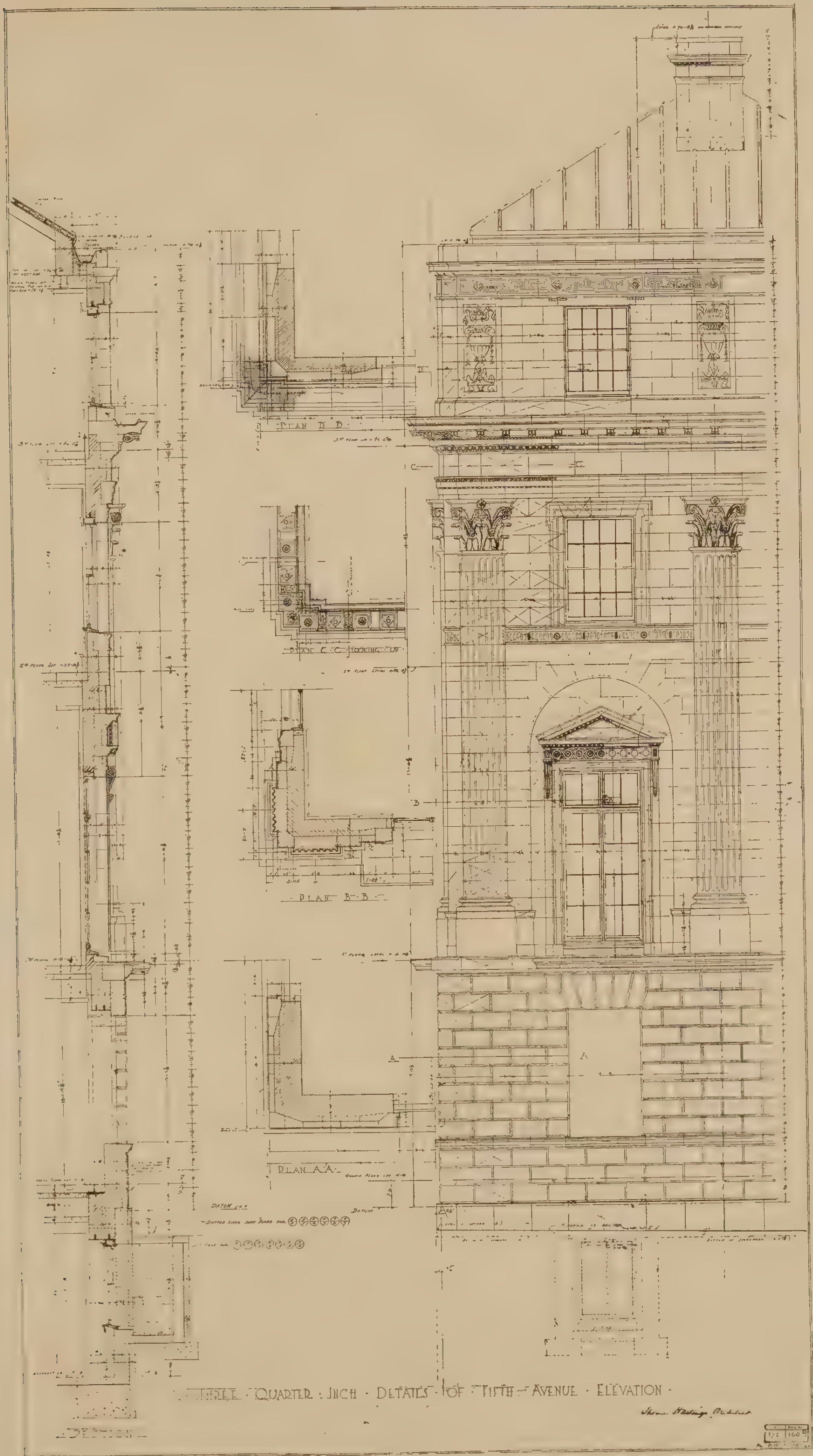
F. W. Connor, Architect

HOUSE, C. LEDYARD BLAIR, 2 EAST 70TH ST., NEW YORK.

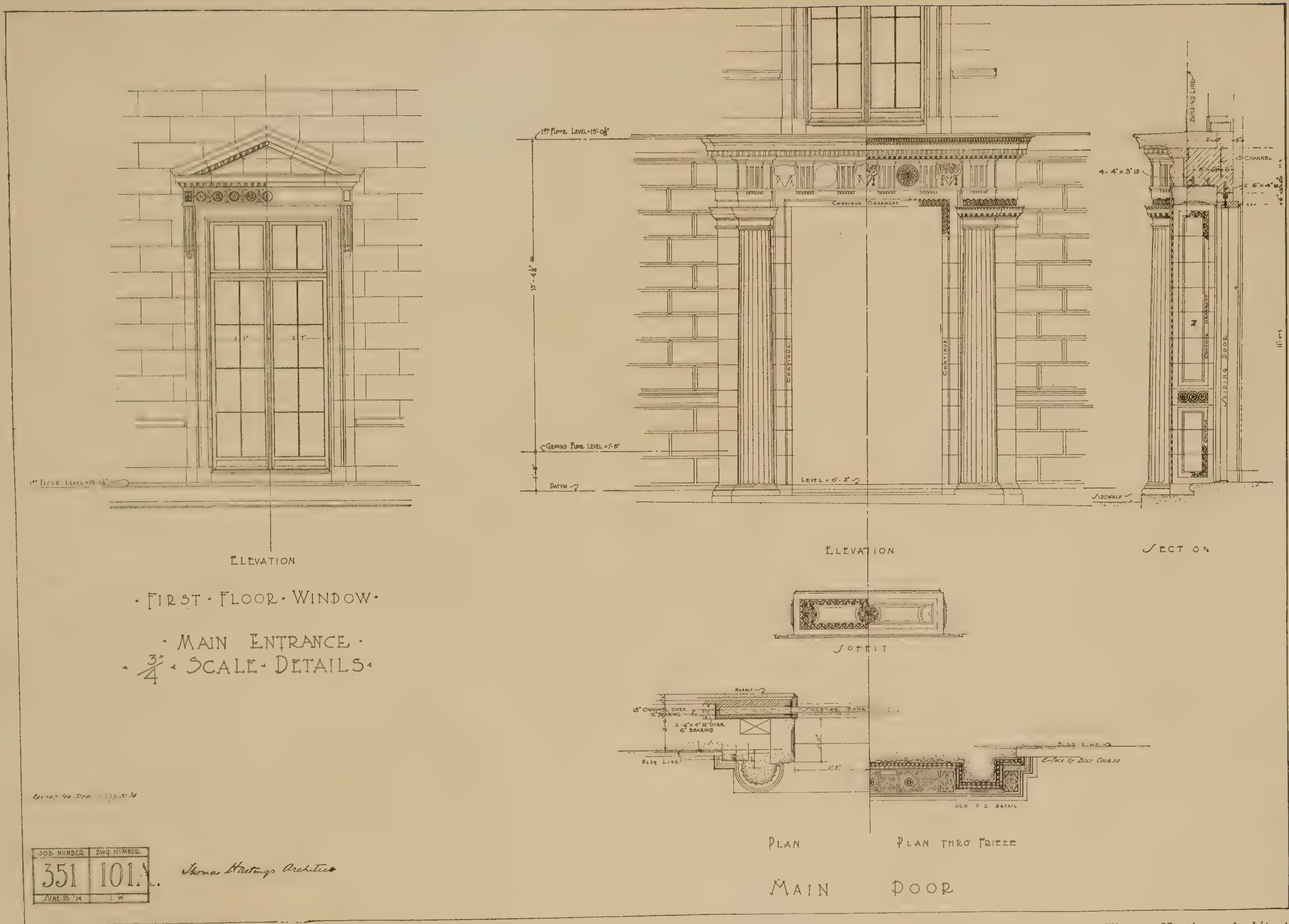
Thomas Hastings, Architect.

ENTRANCE, HOUSE, C. LEDYARD BLAIR, 2 EAST 70TH ST., NEW YORK.

Thomas Hastings, Architect.

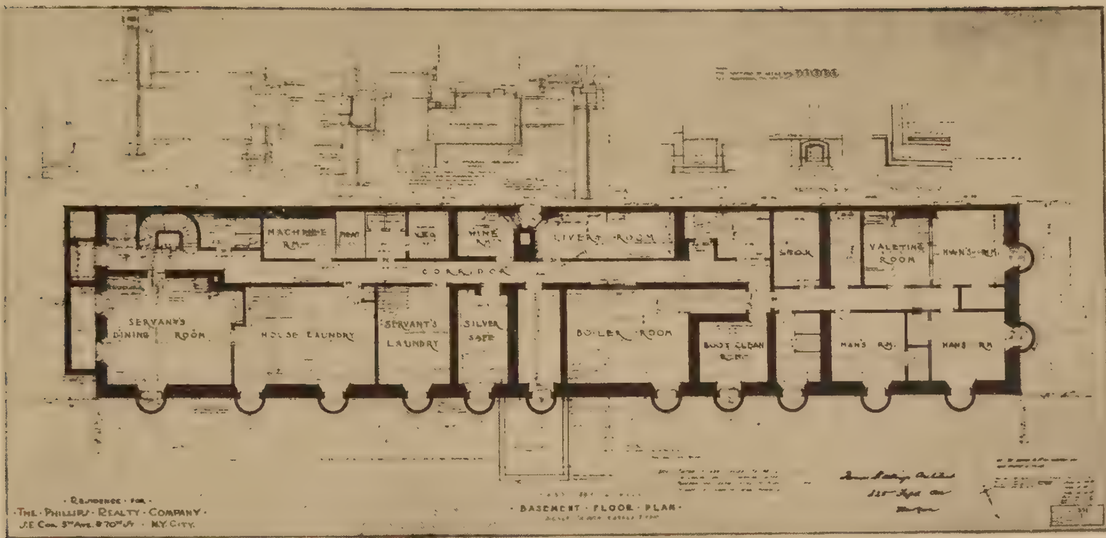


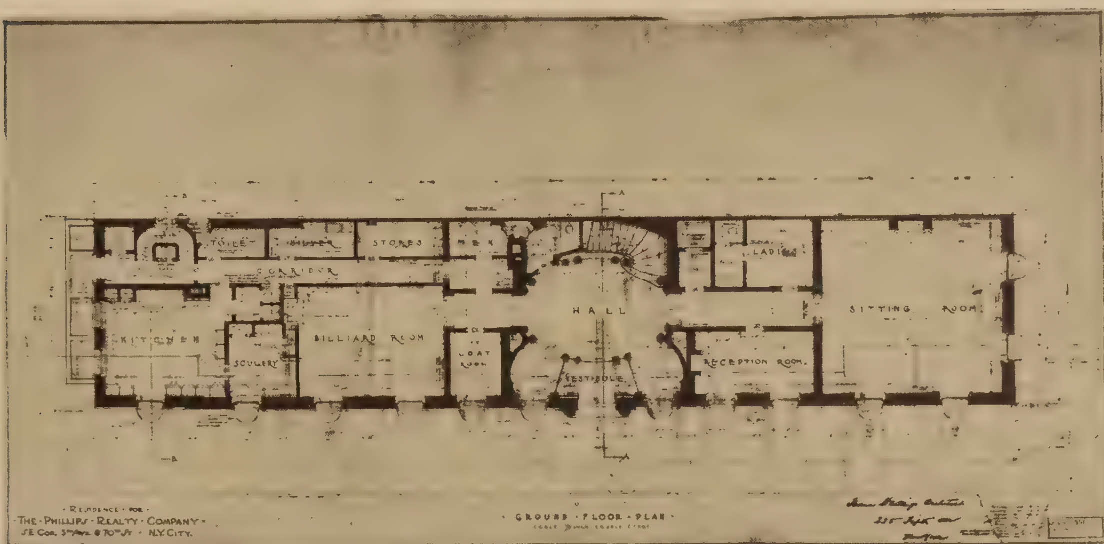
DETAIL OF ELEVATION, HOUSE, C. LEDYARD BLAIR, 2 EAST 70TH ST., NEW YORK.
Thomas Hastings, Architect.

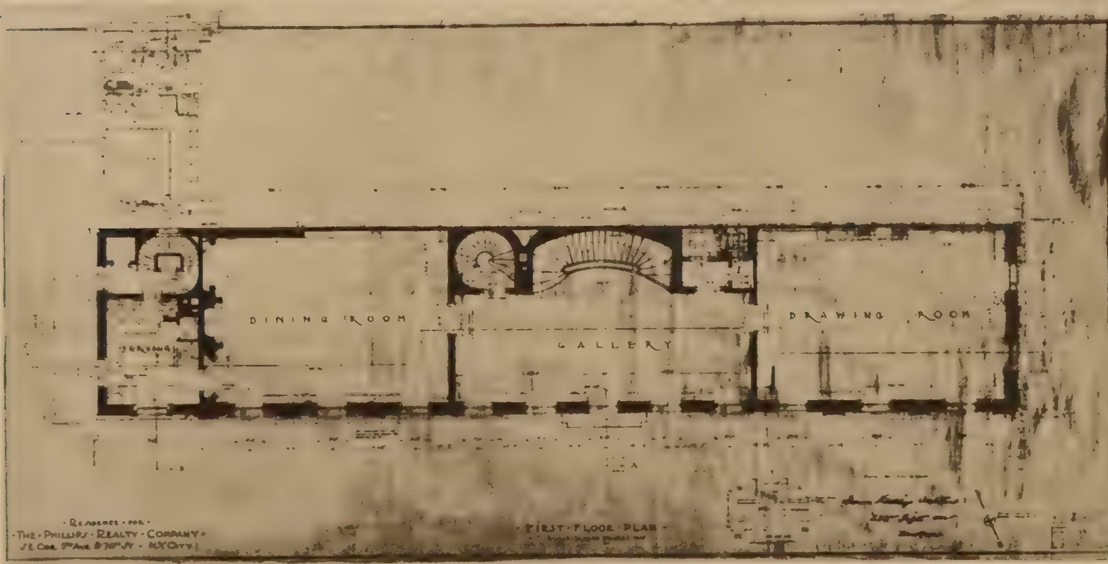


DETAIL OF MAIN ENTRANCE AND FIRST FLOOR WINDOW, HOUSE, C. LEDYARD BLAIR, 2 EAST 70TH ST., NEW YORK.

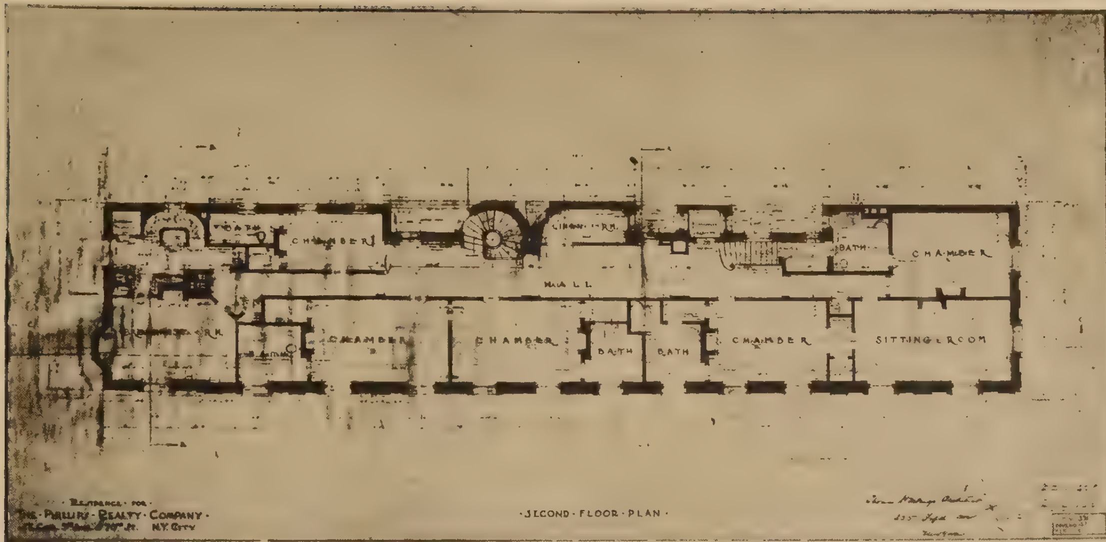
Thomas Hastings, Architect.

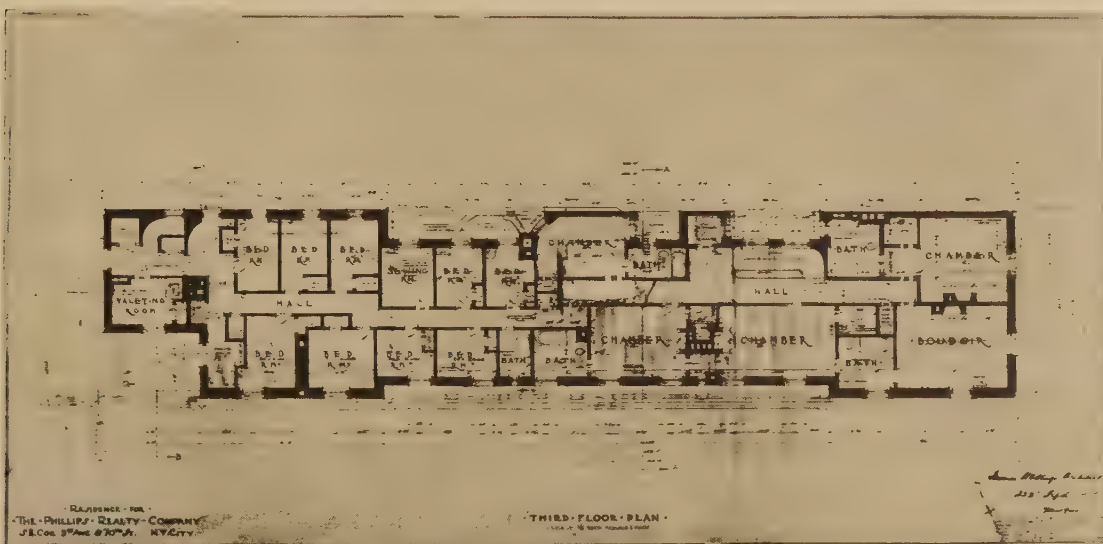


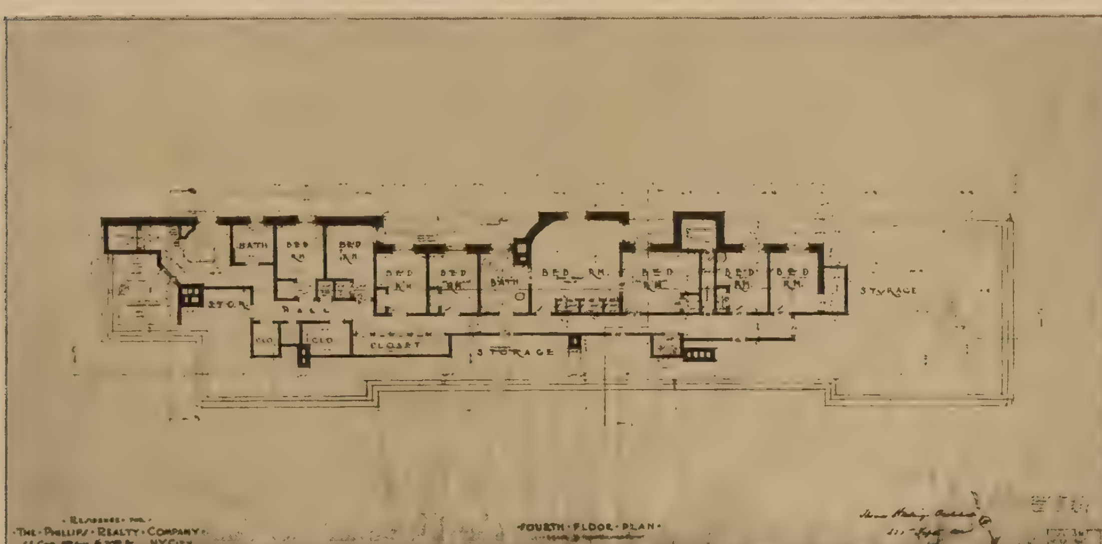




PLANS, HOUSE, C. LEDYARD BLAIR, 2 EAST 70TH ST., NEW YORK. Thomas Hastings, Architect.





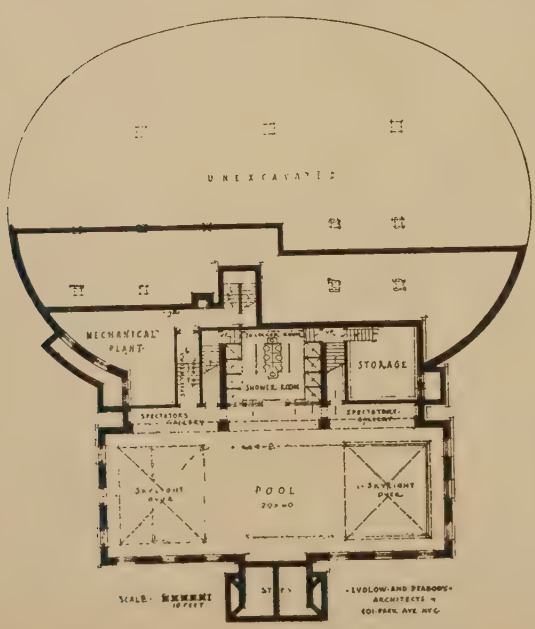


PLANS, HOUSE, C. LEDYARD BLAIR, 2 EAST 70TH ST., NEW YORK. Thomas Hastings, Architect.

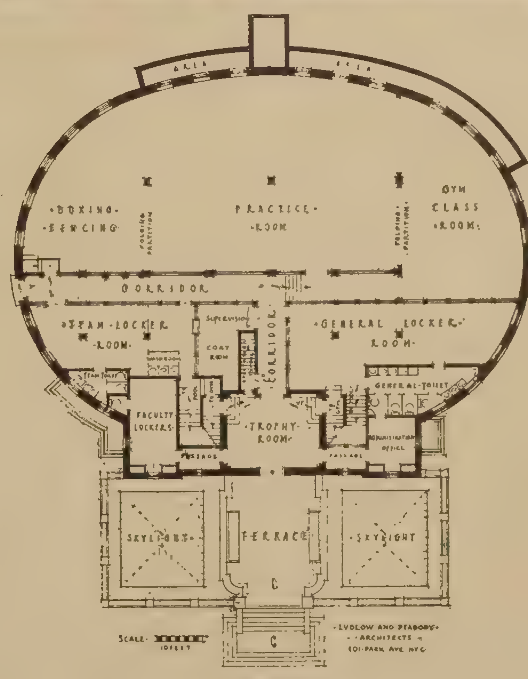
WILLIAM HALL WALKER GYMNASIUM, STEVENS INST. OF TECHNOLOGY, HOBOKEN, N. J.

Ludlow & Peabody, Architects.

DETAIL, WILLIAM HALL WALKER GYMNASIUM, STEVENS INST. OF TECHNOLOGY, HOBOKEN, N. J.
Ludlow & Peabody, Architects.



Basement Plan



First Floor Plan

DETAIL AND PLANS, WILLIAM HALL WALKER GYMNASIUM, STEVENS INST. OF TECHNOLOGY, HOBOKEN, N. J.

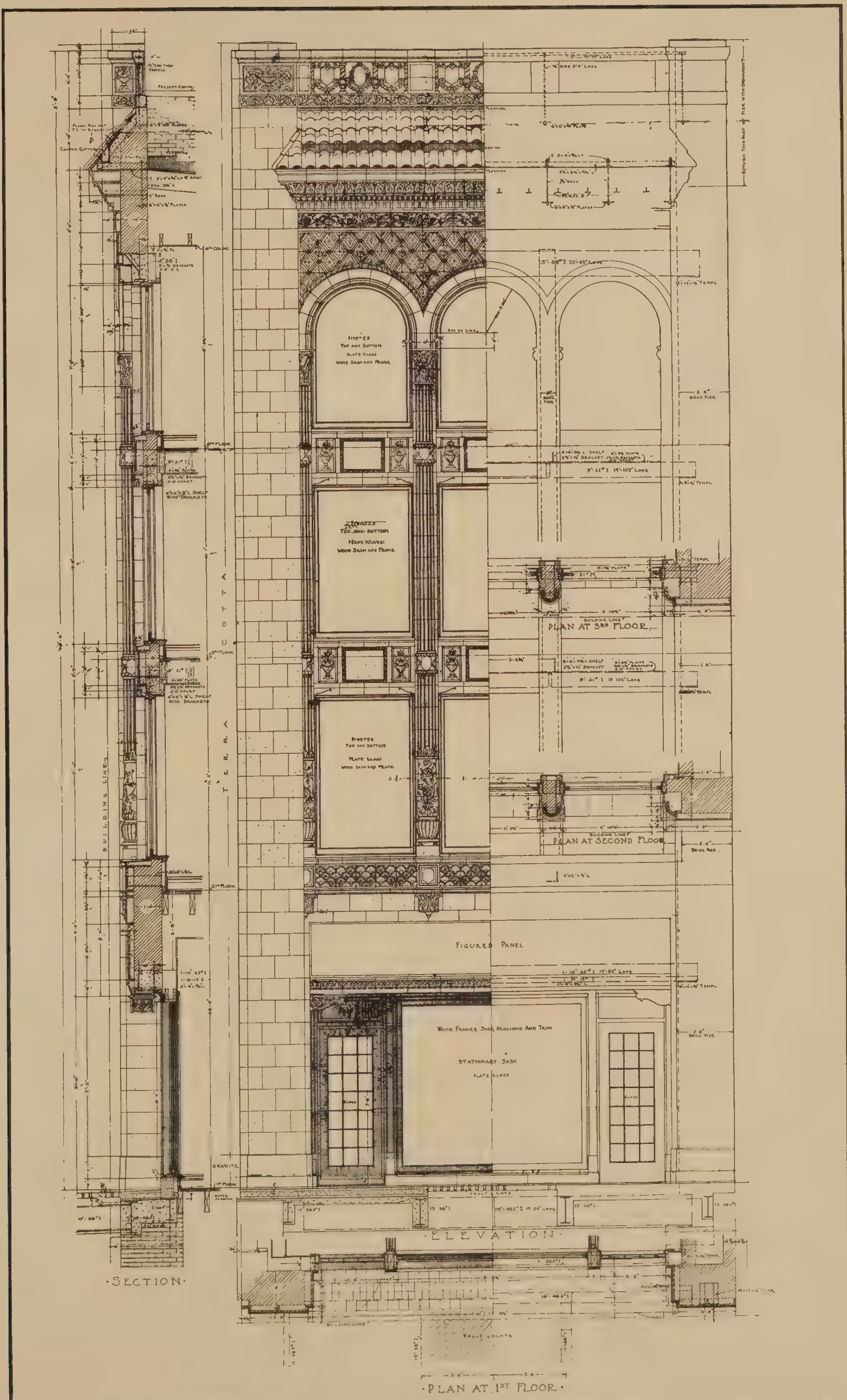
Ludlow & Peabody, Architects.

DETAIL, MEHLIN BUILDING, 4 EAST 43D ST., NEW YORK.

Andrew J. Thomas, Architect.

SCALE DETAILS, MEHLIN BUILDING, 4 EAST 43D ST., NEW YORK.

Andrew J. Thomas, Architect.



DETAIL OF ELEVATION, EDISON SHOP, SYRACUSE, N. Y.

Shape & Bready, Inc., Architects.

(Continued from page 15)

specifications and superintending the construction of the building, it appeared they had been paid $6,000 on their commissions by the corporation, the receipt for the last installment being for "one thousand dollars final payment drawing plans." It was held that the defendant was not required to employ the architects to superintend the construction of a building according to plans and specifications different from those prepared by the plaintiffs. The Court said that the purpose in dividing the commission and permitting the defendant to pay a lump sum is satisfaction of the services rendered in preparing the plans and specifications and in obtaining bids was to afford the corporation an opportunity to exercise its discretion as to the completion of a building in accordance with the plaintiffs' plans and specifications.—Hewitt *vs.* Webb, Pennsylvania Supreme Court, 98 Atl. 609.

Where Architect's Certificate Condition Precedent to Action.

Under a building contract the price was payable only upon certificates signed by the architect, and 90 per cent. of the value of the work was payable on satisfactory completion, and the balance thirty days afterwards. The contractor sued on the contract, alleging full performance and a fraudulent refusal of the architect to issue a final certificate. It was held that it was incumbent on him to prove such allegations by a preponderance of the evidence. It was undisputed that certain work was left undone, but the contractor claimed the contract was substantially completed. It was held that the importance of the uncompleted work is not to be tested by the proportion of its cost to the full contract price when, considered by itself, it was a material and substantial part of the work the contractor agreed to perform. The suit, having been commenced before the expiration of the thirty days after completion, was held premature, and the plaintiff could not contend that the refusal of the architect to issue certificates before the expiration of such time was fraudulent. The obtaining of a certificate from the architect was a condition precedent to any right of action, which condition was to be strictly complied with, or good and sufficient excuse shown for non-compliance. The contract provided for arbitration in case of dissent from a decision of the architect. It was held that the refusal to issue a final certificate for the balance due under the contract was a decision by the architect, and in such case arbitration was a condition precedent to a right of action for balance.—Errant *vs.* Columbia Western Mills, 195 Ill. App. 14.

Apartment Houses Not Excluded by Building

An agreement entered into between the owners of land in a residential neighborhood, reciting that after such property had been improved it was frequently depreciated by the erection of stores, or factories, etc., provided that the property should be used for residence purposes only; that no part of it should be used for factories, manufacturing, store, mercantile or business purposes; that no more than one residence building should be located upon a tract of 50 feet in frontage and the same depth; that any such residence building should be built at least 40 feet from the line of the street; and that no residence should be built on the premises costing less than $3,000. This agreement was made a part of all deeds from the owners of the land. In an action for violation of these building restrictions the Ohio Supreme Court holds that they did not prevent the erection of a four-suite apartment house. The Court considered that the term "residence" was here used in contradistinction to "business." It was also to be presumed that the parties to the agreement knew the difference between an apartment house and a private residence to be used by one family, and if it had been their intention to exclude the former it would have been expressly excluded, as were factories, stores, and business houses.—Arnott *vs.* Williams, 113 N. E. 661.

Powers of Rebuilding Commission.

Following the conflagration in the city of Salem of June, 1914, the Massachusetts Legislature passed a statute which was unlike any theretofore enacted in that commonwealth. It created a city rebuilding commission, with power to deal with the extraordinary conditions following the conflagration, and authorized it to make improvements by discontinuing, laying out, widening and altering public ways, to establish building lines, and to forward reconstruction according to adequate city planning. By section 3 the commission was given sole authority to grant permits for the erection of buildings and to make regulations as to the location, materials, and the proportion of lots to be covered thereby. In an action for mandamus to compel the commission to grant a permit for the erection of a brick stable on the plaintiff's lot, the Massachusetts Supreme Court holds that the commission, after establishing its regulations for the erection of buildings in the burned district, might reserve the right to prescribe additional requirements, where safety of life or property or the public health was involved; and though none had been prescribed before the filing of the plaintiff's petition for a permit with plans conforming to the statutes, ordinances, and regulations, the commission, in the absence of an unreasonable refusal of the permit, could not be compelled by mandamus to grant it.—Boucher *vs.* Longley, 113 N. E. 575.

Building Restrictions.

The Illinois Supreme Court holds that under restrictions excepting only porches, bay windows and steps, an inclosed entranceway or vestibule on solid foundation, one-story high, is a violation of the restriction.—Brandenburg *vs.* Lager, 112 N. E. 321.

Destruction of Building by Fire—Installment Due.

A contract for the construction of a building in San Francisco provided for payment by installments as certain parts of the work was completed, on the architect's certificates. The fifth installment was payable when the plastering and outside millwork was finished. When this had been done, but before an architect's certificate had been received, the building was destroyed by fire. The contractor sued to recover the installment. The contract providing that when an installment became due a certificate should be obtained from the architect, the California Supreme Court held that, in the absence of any contrary provision, a certificate would have been necessary for the installment to be payable and right of action thereon to accrue. Where a building is burned before completion, unless the building contract is abandoned, the contractor and owner each must perform his part of the contract. If the whole price is due upon completion, the contractor must complete it before he can lawfully demand payment. If it is payable in installments during the progress of the work, he cannot recover an installment earned, but not paid, at the time of the fire, until the reconstruction has proceeded to the stage necessary to make it due. He must stand the loss resulting from the fire and must replace at his own expense the structure that is destroyed. When he has done so, he may recover the full contract price. He is not excused from completing the performance of the contract by the fact that the fire destroyed the structure already made. It is nevertheless possible for him to begin again and rebuild the entire building. There are cases which hold that upon such a contract, if the contractor neglects to complete the performance after such destruction, the owner may recover from him the installments which had been paid prior to the destruction. But the contract contained

(Continued page 19)

EARLY ARCHITECTURE OF NEW JERSEY	DOORWAY OF THE OLD RUNYAN HOUSE TRENTON N.J. · BUILT · ABOUT · 1765 ·	MEASURED & DRAWN BY A. E. MICKLEWRIGHT

(Continued from page 17)

a provision that if the work before completion should be wholly destroyed, the loss should be sustained by the owner to the extent that he had paid installments or that might be due. It was held that under this provision the contractor was entitled to payment of an installment due at the time of the fire, before reconstructing the building up to the point where such installment became due. The installment was "due" at the time of the fire when the work was finished, though a certificate had not been obtained from the architect; "due" being used in the sense of an installment earned, unpaid and owing, though a certificate had not been obtained to make it payable under the provision of the contract.—Ahlgren *vs.* Walsh, 158 Pac. 748.

Delay Caused by Owner—Waiver of Architect's Certificates.

In a contract for remodeling and constructing a house it was provided that the contractor should forfeit $5 per day for delay in completion, and that payments should be due when certificates of the architects were issued. The work was not completed until about two months after the time fixed. In an action for a balance under the contract, the owner claimed damages for delay, and that the work was not done according to the contract and certificates had not been given by the architect. The plaintiff claimed that the penalty provision was waived by the defendant who placed a large boiler in the basement, and the foundation walls had to be left open some time for that purpose, and also by requiring the doing of extra work, such as the deepening of the cellar, the building of attic stairs, putting in attic windows, and making window and door screens. Another reason assigned for the delay was the extreme cold during a part of the winter while the work was going on, which interfered with the building; but the Court held that that was a contingency against which the plaintiff might have provided in the contract. The testimony, however, was that the defendant's acts and defaults mentioned occasioned delay. It is well settled that if an owner by his own act or default prevents the contractor from performing the contract within the specified time the contractor cannot be held liable under a penalty provision such as that in the contract. His action or default waives the penalty or rather estops him from claiming damages for something for which he is himself responsible. On this issue a finding for the plaintiff was sustained. As to the question that no action would lie because the architect's certificate had not been issued, while the contract was in the usual form where an architect is employed to supervise construction, it was in testimony that the parties never contemplated that the architect who made the plans should make estimates or issue certificates. The architect called once shortly after the work was begun and looked at the building, but the defendant did not ask him to certify what was due under the contract. On the contrary, the defendant made payments to the plaintiff from time to time without mention of estimates or certificates. Aside from the single cursory look at the work, the defendant did not ask the architect to look at the building until more than two years after the work was completed. A provision for the architect's certificate and approval is one that may be waived, and the waiver may be implied from the acts of the owner. Judgment for the plaintiff, crediting the defendant with $10 for work imperfectly done, was affirmed.—Humphrey *vs.* Flaherty, Kansas Supreme Court, 158 Pac. 1112.

Compensation for Extra Work in Superintending.

In an action for extra services for superintending a building, it appeared that the defendant represented to the plaintiff that he contemplated the building would cost from $20,000 to $25,000, whereupon the plaintiff agreed to superintend the construction for $1,500, with the understanding that if the building should cost more the plaintiff's compensation would be proportionally increased. The defendant made many alterations. The plaintiff's petition alleged that it would have taken 8 or 9 months to perform the work as originally planned and specified, whereas it required 18 to 19 months because of the alterations. The Texas Court of Civil Appeals held the petition to be sufficiently specific. In such an action it was held that the plaintiff could recover reasonable compensation for extra services in superintending the building and additional improvements, performed at the defendant's instance, if such extra services were not provided for by the contract. As the plaintiff sued in the alternative upon either express or implied contract, evidence as to reasonable value of such services was admissible.—Shear *vs.* Brunyere, 187 S. W. 243.

Wrongful Excavation on Adjoining Owner's Lot.

In an action for damages to the plaintiff's building it appeared that a building contractor excavated on the defendant's lot and in so doing excavated into the plaintiff's lot and caused her building to collapse. The Kansas City Court of Appeals held that the fact that the work was for the defendant's benefit, was paid for by his check, and that the defendant's agent sought permission to excavate on the plaintiff's lot, were sufficient to raise the presumption that the work was done by the defendant's servants and to charge him for damages resulting. The excavation not being the lawful excavation on the defendant's own property, but the wrongful excavation on the plaintiff's lot made the defendant liable.—Knoche *vs.* Pratt, 187 S. W. 579.

Creation of Building Restriction.

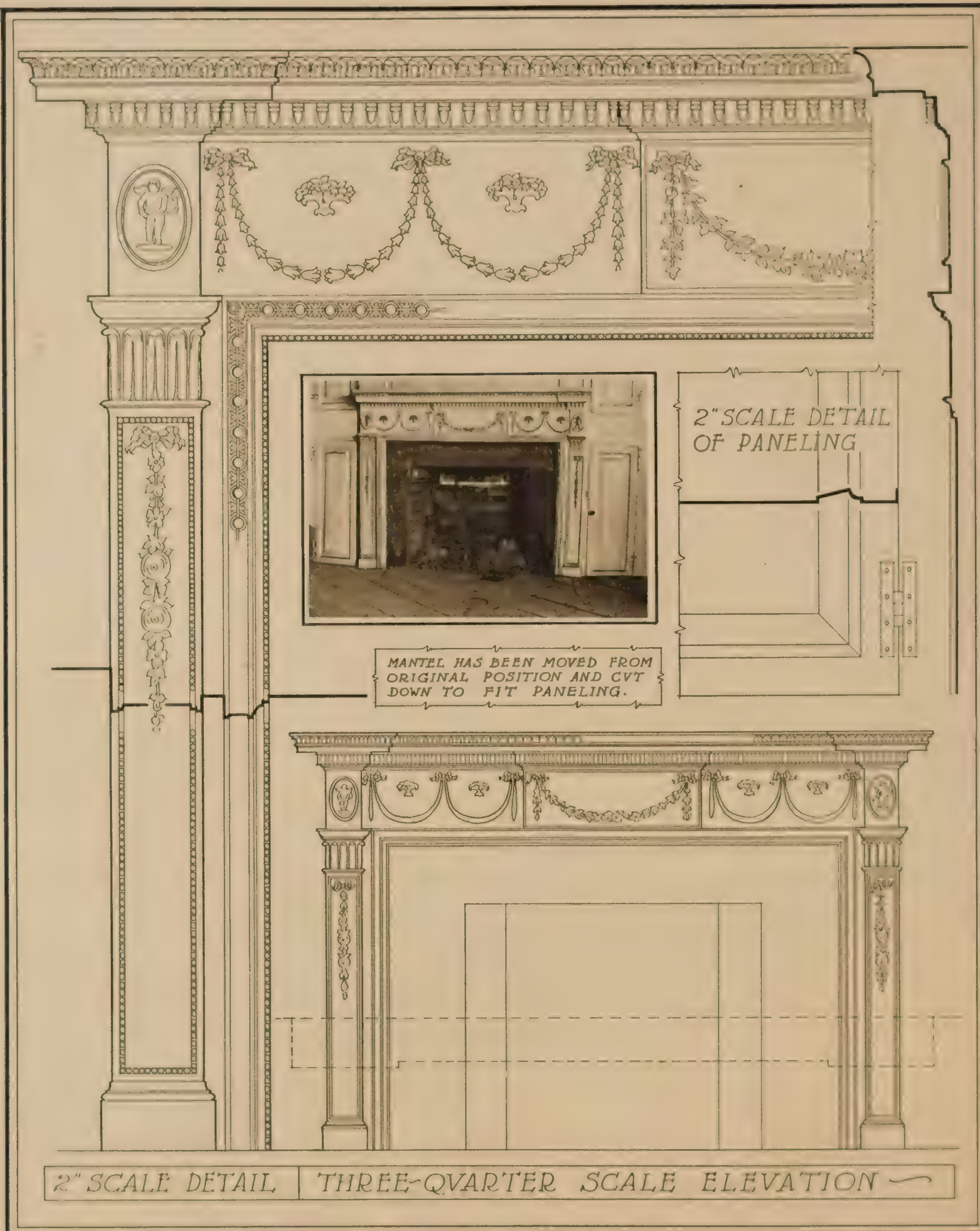
The Supreme Court of Missouri holds that a covenant as to restricted use of property imposing a limitation on the fee, necessary to prevent the owner building on it where he will, can be created only by express words or by reasonable implication from words employed clearly indicative of such a purpose. It cannot be created by broken lines on a plot marked "building lines," where neither the acknowledgment to the on the plot, make reference to such lines.—Zinn *vs.* Sidler, 187 plot nor the deeds conveying the lots, as marked and designated S. W. 1172.

Where Necessity for Architect's Certificate Waived.

In an action to foreclose a mechanic's lien and to recover for work done, a demand for payment and the production of an architect's certificate, under a contract providing that payments shall be made "only upon certificates of the architect," is unnecessary as a condition precedent to the suit, when the owner has been guilty of a breach of the contract, and work is thereupon discontinued.—Albright *vs.* Trinity Presbyterian Church, 160 N. Y. Supp. 598.

Erecting Building Partly in Street Not Substantial Compliance with Contract.

The California Supreme Court holds that a contract to erect a building for $3,565 upon certain land is not substantially complied with by erecting it partly upon an adjoining street, where the cost of correcting the fault would exceed $600. A contractor for the foundations of a building constructed them by mistake partly in the street. The second contractor, under a contract to build wholly on the owner's lot, erected a building on the foundations. It was held that the second contractor, rather than the owner, should bear the loss where both were ignorant of the first contractor's mistake.—Herdal *vs.* Sheehy (Cal.) 159 Pac. 422.



EARLY ARCHITECTVRE OF NEW JERSEY

MANTEL FROM THE HOPKINSON·HOVSE·BORDENTOWN BVILT ABOVT 1760

MEASVRED & DRAWN BY A·E·MICKLEWRIGHT

ARCHITECTVRE

THE PROFESSIONAL ARCHITECTURAL MONTHLY

VOL. XXXV | JANUARY, 1917 | No. 1

ARCHITECTURE, Edited by a Board of Architects in the interests of the profession, is published the fifteenth of every month by FORBES & COMPANY., Ltd., (A. Holland Forbes, Prest.), 527 Fifth Avenue, New York. Chicago Office: Marquette Bldg. James A. Buchanan, Representative.

PRICE, mailed flat to any address in the United States, Mexico or Cuba, $5.00 per annum in advance; to Canada, $6.00 per annum; to any foreign address, $7.00 per annum.

ADVERTISING RATES upon request. The writing and displaying of Advertisements is an art in itself, and the publishers will be pleased to give the Advertiser the benefit of an Expert's experience in this line at no additional expense.

ENTERED at the New York Post Office as second-class mail matter.

PLATES AND ILLUSTRATIONS

Editorial

The Architectural Draughtsman—Stadia—Street Improvements (?)

Editor, ARCHITECTURE.
Dear Sir:

With reference to articles or letters which have appeared in your magazine in the last few months—if it is so that the draughtsman is unfortunate in that he is one, one thing to do, along with commiserating with his unhappy state of being, is to try and locate the trouble, and then to fix it up so that the draughtsman will be happy in his work, as he should be.

This feeling of dissatisfaction which has been voiced somewhat in the letters referred to, is some times a state of mind, caused, not by work, but by a too active ambition or by just a little old-fashioned laziness, a desire to be a boss and sit and smoke or take lunch with clients.

There seems to be just cause for dissatisfaction with the draughtsman. He knows his business and works hard, yet no apparent headway is made, and one after another his dreams fade, and he just jogs along, or he quits and goes into something else.

This man is not above the average, nor below it. He is the one who interests us. He is one of the big majority of workers in the offices of architects.

The artistic genius, or the man of exceptional business ability, gets along no matter what the conditions; the laggard will fall behind no matter what the incentive to go forward. The average man will go forward steadily under the right conditions. Under the wrong conditions he is liable to failure and to discontent.

It is true that there is general discontent among draughtsmen who have passed into middle life. Their salaries do not seem to be in proportion to their knowledge of the work, nor their length of service. They are disappointed in themselves, and appreciate keenly the unspoken disappointment of their family and friends. They come to the conclusion that there is no future for them in their work, and become discouraged and hardened against their profession. They begin to lose that enthusiasm which makes dreams and attainments possible. These cases are so very frequent, that we cannot but believe that something is wrong somewhere. A man's work should increase his happiness; his attainment should be in proportion to his work. When neither of these things is true, something is certainly wrong with conditions with which such a man has surrounded himself, or with which he has been surrounded. It is either his fault, the fault of the man for whom he works, or perhaps the fault of both.

Looking for a moment on the other side, the side of the

Continued page 23)

ARCHITECTURAL FEATURES FOR THE GARDEN FINE EXAMPLES OF PERGOLA, LATTICE AND GARDEN WORK

(Continued from page 21)

architect, we find that they generally make very little out of their profession. In their own hearts most of them will admit a feeling of disappointment in themselves and in their profession, not because the work itself loses its charm, but because it is always such a struggle to make ends meet, to pay the draughtsmen and the grocer. This becomes such a fixed condition of mind that their profession degrades into merely a means of livelihood—and they had intended that it should always remain their one big inspiration—the means of expression of all their years of imagining, the something material into which to translate what they felt of beauty, of sympathy and truth; and that love for their chosen work should always be there to lure them on to think and feel more and to accomplish more.

The draughtsman who never realizes his ambition of becoming an architect truly has a big disappointment to live with. The architect, and most of them come in this class, who starts out to do something that will add a little to the art that people treasure, and then finds, as the years go by, that he is forced to think always of the business end, always of the fee, always to rush the work so that he can continue in business, and so to continue to hope for the prosperous times that never come, he also experiences a bitter disappointment.

If the draughtsman had a thought for the architect, and the architect in turn interested himself in the welfare of the draughtsman, perhaps something could be done that would make both happier.

That the draughtsmen as a body, if they would do so, could help the architect to be more successful, is certain. They could reduce the waste that is in every office, and in a hundred ways could make the architect's office a better paying investment, and a happier place in which to work. That the architects would turn about and do their part is uncertain, but at least they would be able to afford a little time to think it over.

Yours very truly,

New York. Victor Eberhard.

THIS seems to be the appropriate season to say something about one of the most interesting developments in our recent American architecture—the stadia which have been constructed at so many of our universities. Probably every reader of Architecture has this last Fall on one Saturday or another, sat in one of the stadia to watch a foot ball game or a pageant, and very many of us have been impressed with the enormous sums expended upon them, with their lack of what we consider as architectural treatment and with the impressive dignity which seems to be a common characteristic of all of them. All of these buildings are in plan frank adaptations from the Classic stadium and while, for the most part, they have not been so lavishly decorated or so thoughtfully designed for architectural effect as were the Classic stadia, and therefore their exteriors are not of especial excellence, some of them are of such vast proportion and of such excellent outline, that they are structures as impressive as our skyscrapers.

For very many years our universities have had wooden grand stands of some sort to accommodate the great throngs of spectators which have gathered at the large games, but these stands were found to be impermanent, sometimes frail, and always dangerous in case of fire, and while several accidents have occurred, due either to the collapse of the wooden grand stands or to panic conditions consequent upon their catching fire, the miracle is, not that there have been such accidents, but that they have not been more frequent and more serious. It was inevitable, with the steady growth in popularity of football, and the enormous gate receipts at the large games, that safer, larger and more permanent structures should be erected.

If memory serves correctly, the first university to call its grand stand a stadium was the University of Syracuse and very soon thereafter the first of the well known stadia, that on Soldiers' Field at Harvard University, was built from drawings by McKim, Mead & White, seating nearly 40,000 people, which was considered quite an extraordinary achievement. It was then and still remains in some respects the most impressive structure of its sort in the country. Following Classic tradition, McKim, Mead & White felt it necessary to adorn the top by a series of concrete columns, supporting the roof covering of a promenade. The interior was left plain, except for the slightly decorated wall eight or ten feet high, around the playing field. Soon after the Harvard stadium was erected, the University of Pennsylvania built its grand stand of concrete and brick, not indeed, in the familiar horse shoe form of the stadium, but rather following the design of the previous wooden grand stand, and there is perhaps no field in the country where the combination of gymnasium and athletic field has been so agreeably handled as there.

The stadia have not been constructed as a portion of the general athletic equipment of the college, but as separate entities, perhaps with an increase in their impressiveness, although at the expense of logical co-ordination of athletic functions. The stadium at Princeton and the Yale Bowl are both remote from the gymnasiums of those universities and are completely separate from the dressing rooms, showers, etc., of the athletic teams, a thing which, though not desirable in itself, is probably caused by the fact that no one has yet been able to design a stadium which would properly enclose the three principal activities of our colleges, baseball, football and track athletics. Perhaps the best attempt to design a field of this kind was that made by Messrs. Palmer & Hornbostel for the projected athletic field for Columbia University, which was to have been built (and may perhaps still be built) on land reclaimed from the Hudson River near the university.

The most impressive of the stadia on the exterior is unquestionably the Yale Bowl, and also there is probably no other stadium which is so conveniently planned for entrance and exit. Approaching the Yale Bowl from any side, one sees only a steep grassy bank pierced by many concrete doorways, resembling as much as anything else the concrete and earth fortifications of the last century, and the impressive appearance of the stadium is due not so much to any columnar architecture as to the vast and orderly proportion of the field as a whole. The thing is so big, so simple as to inspire a feeling almost of awe at the ability of mankind so to change the face of nature, and it is probable that this feeling is increased rather than lessened by the extreme simplicity of the design and by the absence of visible mason work except at the doors. We are accustomed to see enormous structures which are obviously structures; we are not so accustomed to tremendous and regular earth works, and as we approach the Yale Bowl we think instinctively of prehistoric mound builders. The interior is for some reason not quite so impressive as that of the Princeton stadium, which is the most completely satisfactory, although the exterior is raw, crude and unfinished.

The Gothic treatment adopted in deference to the general Gothic feeling pervading the University buildings, has not been carried out as well as could be desired, and the obviously post and lintel construction showing through the arcade is by no means happy. Yet the interior is the best of all and it is very difficult to assign any definite reason for this fact. There must be some happy choice of proportion, added to the very interesting, lovely and varied color of the concrete, producing this effect, and there is no sight more impressive than the enormous flight

Continued page 25)

ARCHITECTURAL FEATURES FOR THE GARDEN   FINE EXAMPLES OF PERGOLA, LATTICE AND GARDEN WORK

(Continued from page 23)

of great steps, pierced by small openings, which constitutes the Princeton stadium, especially when there is a sufficient number of people assembled in it to give it scale without hiding the color and form of the structure itself.

All of the stadia from time to time have been used for something else besides grand stands at athletic events, and it has become a customary event in each college to have in the stadium a dramatic performance of some sort, such as, for example, the "Joan of Arc" which Miss Adams gave in the Harvard stadium a few years ago, the pageant in the Yale Bowl this Fall, or the Greek plays which Granville Barker presented at a number of the universities last spring. One stadium at least, that of the College of the City of New York, was designed with a very definite intention to use it for this purpose, and this Fall two performances of opera were given there.

The chief argument against the stadia has always been that their utility was confined to such a small period of time. At neither Yale, Harvard nor Princeton are they full for more than two hours in any one year, and every occasion when they can be properly used for other activities gives them more meaning and a better excuse for being.

DURING the past summer the writer passed along a number of roads which were being "improved" with concrete sidewalks, by the municipalities in which the roads were located, and in a number of cases these sidewalks were being installed where none had previously existed. The apparent arrangement in every case was one that has grown to be more or less the standard in our suburbs. In the center of the street was sixteen to twenty feet of pavement of highly durable material, such as Amasite or Warrenite, and from the sides of this to the gutters was softer and less permanent material. In country roads no curbs were installed and the gutters were of sod or of cobble stone; adjoining the gutters was left a space perhaps four feet in width; then the concrete sidewalks about four and one half feet wide, bearing an invariable relation to the edge of the central pavement and running at an even pitch and in straight lines, regardless of any natural conditions. In two cases it was necessary to remove long rows of very old trees which were growing in the position where the street commissioner had located the sidewalk and though all public property is, as a rule, sufficiently wide to permit the relocation of sidewalks to one side or the other of the natural obstacles, these things are apparently seldom taken into account and in order to produce a sidewalk of mathematical correctness, the tree growths of decades, or even centuries, are destroyed and the disfigurement of the landscape is irreparable.

There seems to be no intelligence displayed in the layouts of sidewalks; it appears to make no difference to the engineer whether the property is in a city street bordered by closely built up houses, in a suburban community, or in country fields, which are being divided into lots by some land company; the streets are laid out in the same way regardless of the natural features, and in a single customary way. There is no sense or excuse in such a layout; the space between the gutter and the sidewalk is left with the idea that turf or planting will beautify the road, and sometimes a few bushes or spindling trees will be inserted in this space and left to grow or wither as they may. This in spite of the fact that by moving the sidewalk a few feet one way or the other, a very beautiful and old series of trees or bank of shrubbery might have been preserved.

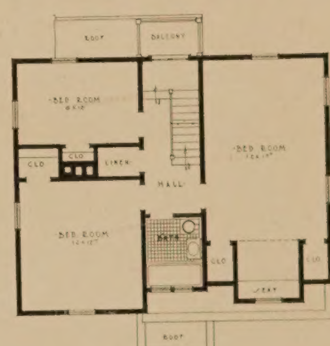
Not infrequently native features of the landscape are destroyed because of a change in grade. The engineer seems to feel always that if he is reducing the grade of a street, he must reduce that of the sidewalk to a parallel with it, although the property may be eight or ten feet above this sidewalk and in the process all vegetation may be destroyed and the houses left inaccessible. It is unquestionably good sense to lower steep grades intended for vehicular traffic, but for foot passengers low grades are not so necessary, and certainly to them pleasant surroundings are of the utmost importance.

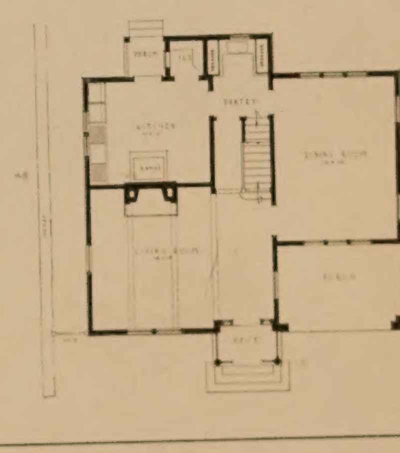
While the greatest amount of damage to old work is probably done through changes in the level of position of sidewalks, or the reconstruction of sidewalks, our real estate companies seem seldom to regard anything but a map of the property, and not a contour map at that, when they lay out new suburban developments, and as for changing the line of pavement in the street because of an old oak or a beautiful growth of native shrubs, the thing is seldom considered. The writer does remember two cases where streets have been deflected from their natural courses in order to preserve trees or interesting bits of woodland. One is at Sea Cliff, Long Island, where toward the top of a long hill the road divides, leaving a sort of island in the center about thirty feet wide and one hundred feet long, containing some lovely trees and good shrub planting. This appears to have been more or less accidental, but, at least, the village authorities have had intelligence enough to leave it alone and keep it in good condition. The second case is at Kenilworth, Illinois, one of the suburbs of Chicago, where the landscape architect who laid out the village for one of the land companies, has in several cases left great trees in the center of the streets, surrounded by small patches of shrubbery. The extreme pleasure which these fortunate accidents give to the passerby cannot be explained by the simple assumption that they are interesting because they are unusual Every one knows that the streets of our great cities would be much improved by terminal features to the long vistas which they create and the same thing is true of the vistas on country roads. The straight country road is not quite as stupid as a straight city street, because the borders are continuously varied and often interesting, but interruptions to the vistas in the shape of big trees or parking spaces are not only delightful in themselves, but enhance the appearance of the street as a whole.

One of the unfortunate things about most of our real estate developments is that in their attempt to include in their attractions all the conveniences of city dwelling, they have followed too closely city methods of installing these conveniences and we often find that sewer systems and water systems are run under the centers of the streets, where there is enormous waste of time if it is necessary to repair them and the pavement above is destroyed and seldom properly rebuilt. In a city where the street is paved from curb to curb, one might as well tear up the center of the street as the side, but in the country, where, as a rule, the center of the street only is expensively covered, all mains for water, sewer, gas, etc., should be installed in the space at one side or the other.

Communities seem to appreciate that land values are greatly enhanced by planting along their streets and roads, and many small cities or towns have been proudly described to the writer by their inhabitants as the "City of Elms," the "City of Maples," or some such title, yet any one of the very cities so described may, in its endeavor to replace its pavement, cut down the big trees along one side of an important street so that the sidewalk may be approximately level and absolutely straight, or the community may permit an electric lighting company to string its wires in such a way and at such a height that the tops of the old trees were destroyed.

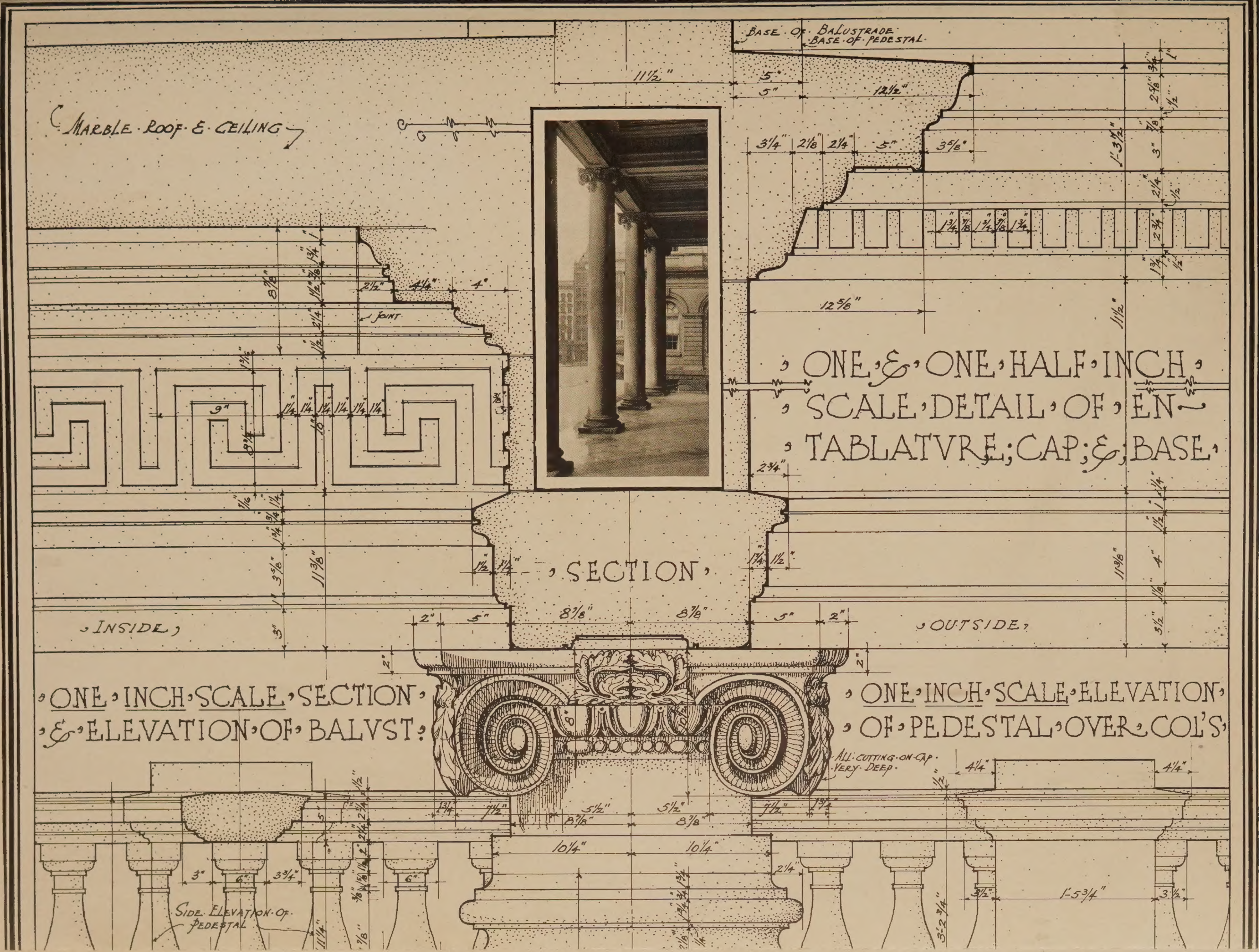
Sometimes it seems as if our American civic pride was a strangely crippled and one-sided creature and that the "conservation" of which we talk so much, was something that is important in Nebraska and unnecessary in New Jersey.

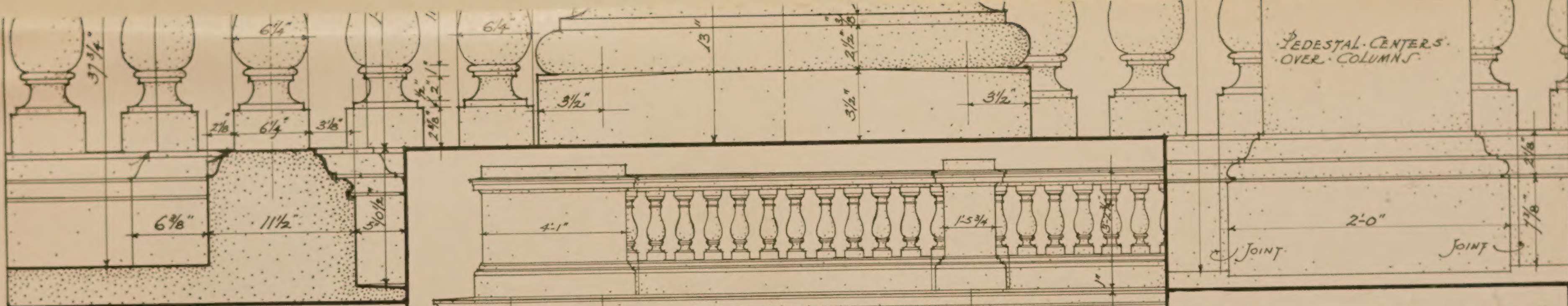


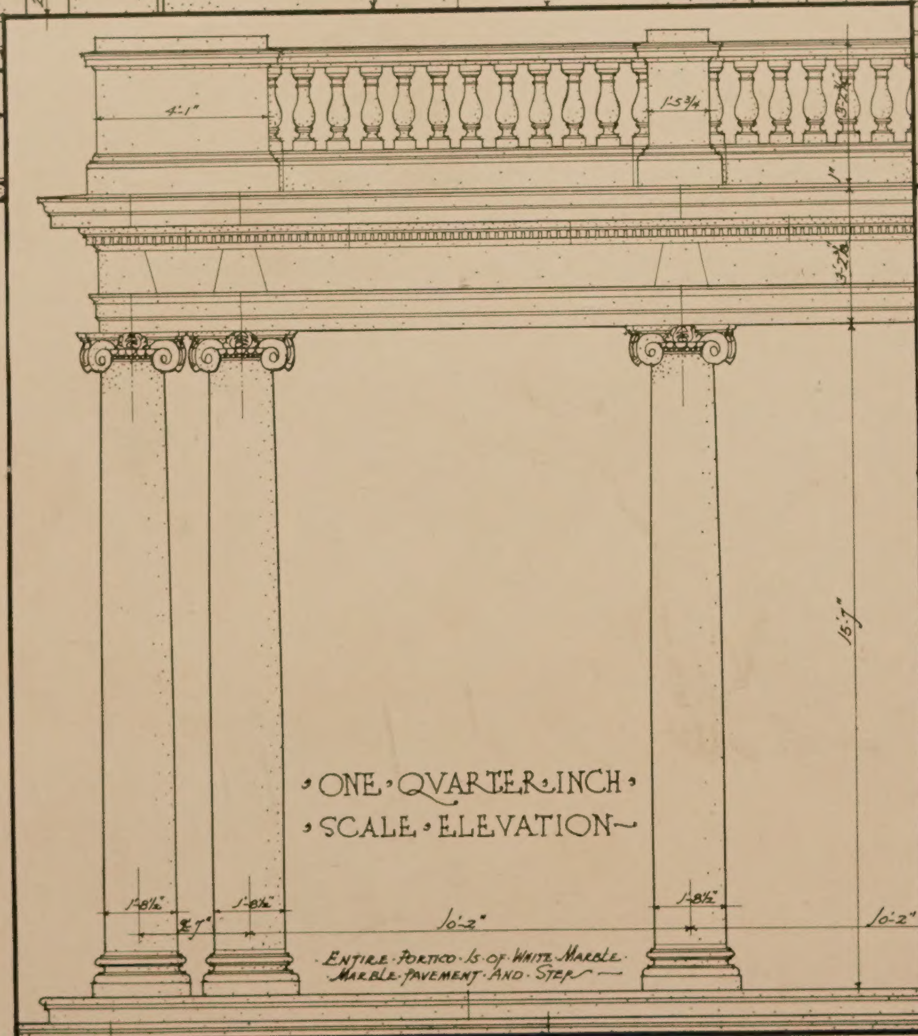


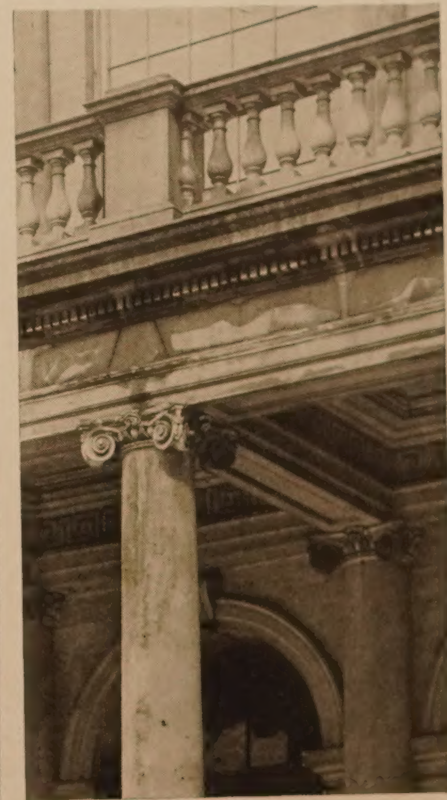
EXTERIOR AND PLANS, HOUSE, ARNO KOLBE, PARK HILL, YONKERS, N. Y.

Arno Kolbe, Architect.


ONE & ONE HALF INCH SCALE DETAIL OF ENTABLATURE, CAP; & BASE
ONE INCH SCALE SECTION & ELEVATION OF BALUST.
ONE INCH SCALE ELEVATION OF PEDESTAL OVER COL'S
SECTION
INSIDE
OUTSIDE
MARBLE ROOF & CEILING
BASE OF BALUSTRADE
BASE OF PEDESTAL
JOINT
ALL CUTTING ON CAP VERY DEEP
SIDE ELEVATION OF PEDESTAL







,"ARCHITECTVRE" SERIES,
·OF·
·MEASVRED·DETAILS·

'COLVMNS'&'ENTABLATVRE'OF'PORTICO'
NEW·YORK·CITY·HALL·
JOHN·McCOMB·ARCH'T

'DRAWING'NO'56'
'FEBRVARY'1917'
DRAWN·BY·WALTER·McQVADE·